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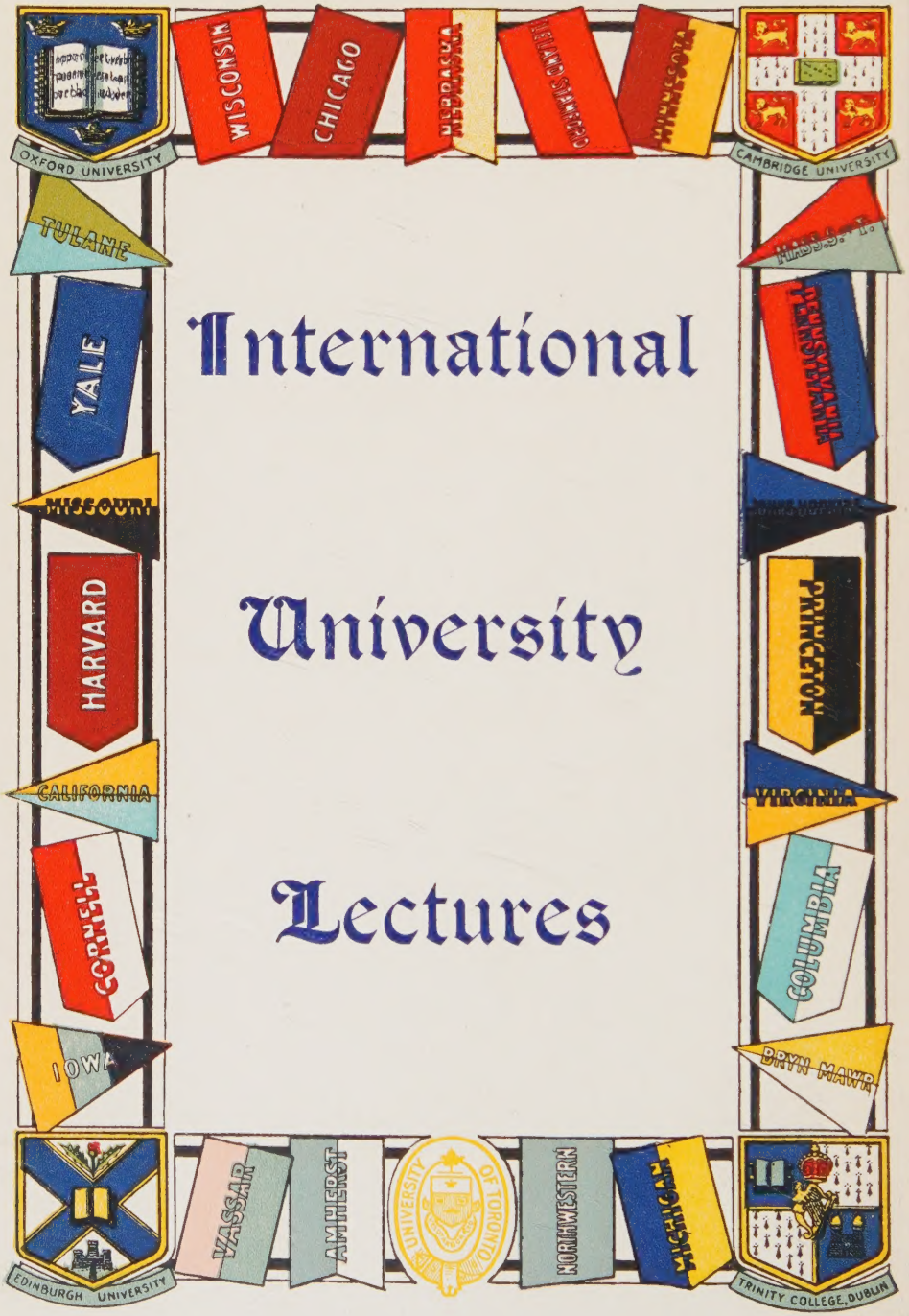

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ELECTRICAL ENGINEERING PROBLEMS OF THE PRESENT TIME

BY MICHAEL IDVORSKY PUPIN.

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ENGINEERING problems differ from crude scientific problems by the definiteness of their aim. They are created by the industrial development of the country, and their solution forms the next step in the progress of this development. The problems in pure science do not have this intimate connection with the present state of the technical arts; they affect it in so far only as their solution contributes additional means for the solution of the existing engineering problems and leads gradually to the formulation of new ones. Public demand is the driving force which impels the engineer in his study of any given problem; the loosest kind of a coupling connects the work of the crude scientist with public demand. This does not mean, of course, the existence of any public indifference in this respect. The intelligent public watches with keen interest the steady progress of pure science; partly on account of the intellectual pleasure which one derives from the contemplation of the beautiful mechanism which purely scientific research reveals in the background of various physical

phenomena, but principally on account of the recognized fact that the progress of pure science leads to the formulation of new engineering problems, the solution of which is essential to our immediate social progress, our moral and material development. The intelligent public knows with a certainty amounting to mathematical accuracy when the time is ripe for the formulation of new engineering problems, and it is ready then to lend its strong support to the engineer who offers a solution. When Bell discovered a method of obtaining an electrical facsimile of articular speech, and constructed the first telephone which represented an embodiment of his great discovery, the intelligent public understood readily that the time was ripe for the formulation of a new engineering problem, the problem of transmission of speech over long distances. It was ready then to contribute cheerfully its share to the sacrifices which had to be offered, in order to obtain a satisfactory solution of this great engineering problem. It is, indeed, not a mere accident that the most intelligent state of this union, the state of Massachusetts, contributed far more than any other state to the sacrifices which had to be offered, in order to develop Bell's remarkable discovery and invention into the greatest civilizing agent of modern times.

These are the considerations which guided me in answering the question: Which of the many electrical problems of to-day should be considered as the "Electrical Engineering Problems of the Present Time"? Evidently those electrical problems must be selected the solution of which, in the opinion of all competent judges, represent the next step in the evolutionary progress of the existing electrical industries. Vague and indefinite propositions, such as, for instance, the direct transformation of the chemical energy of burning coal into electrical energy, the generation of cold light by electrical processes, and so forth and so on

ad infinitum, must be excluded from this discussion. They are not in any sense of the word electrical engineering problems. The problems discussed here relate to the extension of the existing methods, which have been sanctioned by long practice, in electrical traction, electric lighting, telephony, wireless transmission, and ordinary telegraphy.

The Electrical Traction Problem

Electrical traction has been developing steadily during the last twenty-five years and has covered the field well which was originally mapped out for it, namely, the transportation of light traffic over comparatively short distances. Within these limits it has done its work admirably, surpassing even the most sanguine expectations of its original promoters. These results encourage the public and the engineer in the belief that the time is ripe for the formulation of the new electrical traction problem and for its satisfactory solution.

The new electrical traction problem is the problem of substitution of electric power in place of the steam locomotive on trunk lines; it is the problem of heavy electrical traction over long distances. The problem can be more clearly stated by referring to a specific case. Let us suppose that the Pennsylvania Railroad Company has decided to consider the advisability of equipping its lines between New York and Philadelphia with electric power, and that with this end in view it has obtained a sufficiently large number of reports from competent electrical traction experts. Every one of these reports would contain a careful examination of the problem under discussion, that is, the problem of heavy electrical traction over a distance of one hundred miles which, in the present state of the art of heavy electrical traction, is certainly a long distance. It is

highly probable that no two out of a large number of these reports would agree even approximately in all the details involved in the problem, because there is no doubt that there are a considerable number of pet schemes in heavy electrical traction, each one of which has its ardent admirers and stanch champions. Nevertheless it is fairly certain that they would all agree on the vital questions involved in the problem. These questions are: First, can the existing methods of electrical power distribution over a distance of a hundred miles take care of heavy traction? Second, would substantial administrative advantages, capable of increasing the capacity of the existing tracks, result from the substitution of electrical power for the steam locomotive? Third, could the continuity of service be sufficiently well secured?

The answer to the first question would undoubtedly be in the affirmative in every one of these reports. The powerful electrical locomotive recently constructed by the General Electric Company for the New York Central Railroad and the experimental results obtained with it leave no room for any reasonable doubt that electrical traction machines can be built, which will take care of any practicable load and at any practicable speed. The Westinghouse Electrical Manufacturing Company of Pittsburg is completing for the Swedish Government a heavy traction electrical locomotive, which is considered by some to be even an advance upon the electrical locomotive of the General Electric Company just referred to.

The answer to the second question would also be decidedly in the affirmative in every one of these reports. Very substantial advantages would certainly arise from the substitution of the electrical motor for the steam locomotive. Our entire experience with electrical traction so far justifies this belief, and these advantages are so numer-

ous and so self-evident, that a specific discussion of every one of them would be entirely beyond the scope of this paper, and would, besides, be entirely superfluous. Suffice it to state here briefly the two chief advantages which would arise. They are, first, the possibility of running smaller trains at much more frequent intervals; secondly, higher speeds with greater safety could be obtained. This means a very substantial saving of time and the resulting great increase in the transportation capacity of the existing tracks.

In the popular mind the substitution of electrical power for the steam locomotive seems to convey the idea that the chief object of this substitution is the saving of power; but nothing is as far from the actual point at issue as a view of this kind. The coal-bill is a small item in the operating expenses of a road, and cuts no figure in the study of the problem before us. The cost of the equipment is a different matter; it does cut a very important figure in the operating expenses of the road, and it seems to be admitted on all sides that the cost of the electrical traction equipment would be considerably higher than that which accompanies the employment of the steam locomotive. But the increased transportation capacity of the tracks and the increased safety of transportation would and should more than balance this increase in the cost of equipment.

The third question is: Can the continuity of service be sufficiently well secured with the prevailing methods of electrical traction? To find a complete and satisfactory answer to this question is the most difficult part of the problem.

With the present method of steam locomotive traction every train with its locomotive is an independent unit, so that an accidental derangement of any one of the units does not interfere very seriously with the operation of the

rest of the road. A blizzard or a flood may, to be sure, cause a suspension of operations on the whole road, but nothing short of this inimical action of the elements is capable of producing this result. In electrical traction, on the other hand, the various units on the road are interconnected through the conducting wires which connect them with the power stations. Any accident which suspends the operativeness of a power station will bring to a standstill the whole traffic on the section which is fed by that particular station. This difficulty, however, exists also in the electrical distribution of power for lighting purposes in large towns, and past experience shows that the present methods of electrical central station construction and management make the risks of discontinuity in the service on this score extremely small. It must be remembered, however, that distribution of power for lighting purposes in large towns employs underground conductors, which is one of the most effective means of protecting the continuity of service against the hostile action of seasons and elements. In heavy electrical traction, underground conductors are out of question for reasons which are so evident that they need no further discussion. This introduces one of the most serious difficulties into our problem.

The third-rail method limits the practicable electrical pressure at which the electrical energy is conveyed into the train; besides, it introduces the very serious difficulty of maintaining a sufficiently good electrical contact during the winter season when the ground is covered with ice and snow, not to mention several other difficulties which, it is generally admitted, render the third-rail method entirely inadequate to heavy electrical traction. The overhead trolley seems, in the opinion of the majority of competent engineers, the only permissible method of conveying electrical energy from the central station to the train. At any rate,

this is the meaning conveyed to my mind by the fact that the New York, New Haven and Hartford Railroad Company has asked permission of the legislature to abolish the third rail and substitute in its place the overhead trolley. But if the overhead trolley method is to be adopted, then the smaller the number of wires employed to convey the electrical energy to the train, the better. This seems to me to be the real meaning of the extreme anxiety on the part of the electrical engineer to design as asynchronous single-phase alternating-current motor capable of developing large power. The results obtained in this direction during the last few years are encouraging, and they seem to have brought us very near to the solution of the heavy electrical traction problem. Summing up the considerations discussed above, it seems that the composite judgment of the best technical opinions can be stated somewhat as follows: Convey electrical energy from the station to the electrical locomotive by means of a single-phase alternating current at high tension, say, 20,000 volts, employing, of course, a single trolley-wire. Let the locomotive serve as a substation in which the high-tension current is transformed down to a suitably low-tension, and employ either induction motors or direct-current motors to convert the low-tension electrical power into mechanical propulsion.

The possibility of employing single-phase alternating currents contributes very materially to the possibility of securing continuity of service in heavy electrical traction by reducing the multiplicity of contacts to a minimum; theoretically, one contact for each locomotive. But that single contact must be rendered as secure as mechanical art can make it. The trolley-wire hanging with a convex curvature toward the track and supported on wooden poles such as we see on ordinary trolley-roads would never do. In place of the flimsy structures we must have well-anchored

steel towers supporting messenger-wires of steel hanging in catenary suspensions, and to these the conducting trolley-wires are neatly and securely attached so as to be at all of their points parallel to the track. The whole structure when finished looks like an endless suspension bridge, the steel towers being the piers of the bridge. The messenger-wire represents the gracefully curved span between the piers, and the trolley-wire is the platform over which the traffic of the bridge is maintained. Such trolley-lines have actually been constructed and operated not only out West and in some parts of Europe, as for instance on the famous Berlin-Zossen section, but also on the Long Island Railroad, where electrical traction on a somewhat larger scale is contemplated in the very near future. Structures of this kind are extremely solid and quite capable of defying the most stubborn attacks of the elements, but they are, of course, expensive, and the question arises whether a trunk line, say, between New York City and Philadelphia, equipped for heavy electrical traction in accordance with the most approved methods, so as to secure a rapid transportation of even the heaviest loads in large units as well as in small units at frequent intervals and with perfect security of the continuity of service,—it is a question, I say, whether such a solution of the problem before us is a financially attractive proposition.

There is a strong belief among the progressive members of the engineering profession that the question will be answered in the affirmative in the very near future.

The Electric Lighting Problem

The efficiency of the electrical arc-lamp is satisfactory; its mechanism is somewhat complex, and the sharp shadows produced by a powerful source of light concentrated in a very small volume are objectionable, not to mention

the physiological effect upon the eyes of an intense source of this kind. On the whole, however, this form of electric lighting is considered as highly efficient and effective although not quite so cheap as some of the modern chemical methods of light-generation. Electric lighting by incandescent filaments is the field in which the public is awaiting marked improvements. This is the form in which lighting by electricity is distributed in small units. It is ideal in its simplicity and convenience, but it is a luxury in which the rich, only, can indulge; it is too expensive. The so-called fine arts are aristocratic; science and the technical arts are nothing if not democratic. The fruits of their labor must be within reach of everybody; if not, the soil which bears any particular one of these fruits will not be sufficiently cultivated by the public and it will soon become a hothouse product of the rich or cease altogether. To transform incandescent electric lighting into a democratic institution is one of the electrical engineering problems of to-day. Its solution involved many problems in the economy of generation and distribution of electric power, all of which have been satisfactorily solved by the electrical engineer, so that the main solution has converged finally to the following proposition: To find a substance which will have a sufficiently high resistance, will stand a higher temperature than the carbon filament without too rapid deterioration, and the radiation of which at this high temperature will be rich in visible waves. Osmium, tantalum, and some other refractive rare metals have been tried and seem to promise well. But in many respects the most satisfactory results have been obtained by Peter Cooper Hewitt with his mercury vapor lamp. The efficiency of this form of electric lighting, both in large and in small units, is remarkably high, over four times as high as that by ordinary incandescent lighting, and the simplic-

ity of the apparatus is ideal. In addition to its high efficiency the mercury vapor lamp has the great advantage over all other forms of electric lamps in the fact that its light proceeds from a source which is distributed over a large area. This prevents the formation of sharp shadows, a great desideratum in work-shops, where it is important that the workman should be able to see all around the object which he is handling. For this reason the lamp is making a rapid headway into factories, draughting-rooms, libraries, and laboratories. Its poverty in red rays will keep it temporarily out of the drawing-room and other places where the complexion of things and of people must be shown off at all cost. This, however, seems to be the only defect of this new form of electric lighting and it is sincerely hoped that this defect will soon be remedied.

The Telephonic Problem

The engineer has to determine how much time, money, and personal convenience the average subscriber is willing to sacrifice, in order to communicate with another subscriber in some other place, and then provide a satisfactory service which will return some profit to the operating company or to the state. The proposition is extremely complex, particularly in this country where unexpected legislative action introduces so many unknown quantities into the calculation of the engineer. Every now and then the legislator takes it into his head that he knows more about the science and art of telephone engineering than anybody else, and then, with a bold stroke of his pen, he cancels the final figures of the engineer, the permissible charge, and substitutes his own, looks wise, and leaves the engineer to lament the loss of the fruits of his laborious calculations and to wish that he lived in autocratic Russia where the telephone system belongs to the Czar and no conceited legis-

lator is allowed to interfere with a business of which he has not even the faintest shadow of anything approaching the semblance of an idea. Thanks, however, to the superior intelligence of the engineers of the American Telephone and Telegraph Company and to their extraordinary courage, telephonic art is progressing very favorably in spite of the arrogant legislator and the wicked demagogue, and of the most annoying and heartbreaking difficulties which they are placing, at almost every step of progress, in the way of the patient and intelligent worker in the telephonic field. The American telephone engineer must reckon with an unknown and unknowable quantity,—the legislator. The only satisfactory way to handle this quantity is to ignore it and to adjust the other elements of telephonic problems in such a way that the result will, in all probability, come out right no matter in what direction the legislative cat may decide to jump.

The European engineer is much more fortunate in this respect. The telephone system belongs to the government. The charge is fixed, and if it brings a profit to the state, well and good; if it does not, the taxpayer makes it right. If some taxpayer kicks because he has to pay for somebody else's telephoning, he is told that the existence of the telephone system is of general benefit to the state. It develops commerce and industry and this improves the moral and material condition of all, both of those who telephone and of those who do not telephone. This sounds like good philosophy, and shifts the burden of the argument upon the taxpayer who, for self-evident reasons, generally prefers to argue no further. The permissible charge is, therefore, eliminated from the engineering problems of telephony, in Europe, because it is a fixed quantity; in America, because it depends upon an unknowable quantity, the legislator and the demagogue, the last one often in form of

some sensational newspaper which spares no pains to persuade its readers that the telephone industry in this country is the same kind of an institution as the beef trust, the coal trust, the gas trust, etc., etc.

If there is any technical advance of which this country ought to be proud, it is indeed the art of telephony. In no other branch of engineering or technology has this country maintained its lead as easily as in this, so much so that there is no second, although there is no other kind of engineering which is as highly scientific and technical as telephone engineering; and yet the demagogue paints it in the colors of a beef trust, a coal trust, or some other social aberration of this degenerate age.

Two more essential quantities are left which the telephone engineer weighs in determining the solution of the telephonic problems; these are,—first, the maximum amount of time; secondly,—the maximum amount of personal convenience which the subscriber will sacrifice in order to communicate with another subscriber. The better the service the more will the subscriber sacrifice for it, but at best he is not willing to give up much, and so the final problem of the telephone engineer reduces itself to this:

To provide a first-class service, which will be at all hours and under all conditions of weather at the subscriber's disposal, at a moment's notice and anywhere and with anybody. This problem has been solved in this country and in Germany, as far as local service is concerned, and the great problem in telephone engineering to-day is to do the same thing for the interurban telephonic communication. For example, a telephone subscriber in New York should be able to call up any other telephone subscriber in New York, Boston, Philadelphia, Baltimore, Washington, Wilmington, Trenton, Newark, Paterson, New Haven, Hartford, Providence, or any other populated centre within a

radius of about two hundred and fifty miles of New York City, and get just as quick and just as good service as he gets with any subscriber in his own town. The solution of this problem would mean that all these populated centres within a radius of two hundred and fifty miles, covering a territory of a large empire, would form, telephonically, one town, where within a time interval of a few minutes one could call up anybody that is of any account and have a pleasant chat or any other kind of a conversation. A few years ago the solution of this problem would have been impossible, to-day it is, and the engineers of the American Telephone and Telegraph Company are actually working upon it with all the vigor of their young and well-trained intelligence. A similar problem occupies the attention of the engineers of the Siemens and Halske Company of Berlin.

The new method of high potential transmission of electrical waves by conductors of suitably increased inductance has given them a new weapon for attacking the problem, and they are wielding it with extraordinary force and skill. The telephonic union of the thickly populated centres just mentioned into one community covering the area of a large empire means, of course, the stretching of thousands of wires between such towns as New York, Boston, Philadelphia, Baltimore, and Washington, and that means the employment of cables in underground conduits. No pole line could support anything like that multiplicity of wires. Transmission over underground cables over such distances was an impossibility a few years ago, when a distance of twenty miles was considered quite a serious matter. To-day there is a high-tension telephonic transmission cable containing a large number of wires supplying a most satisfactory telephonic transmission between Boston and Worcester, Massachusetts, a distance of over forty miles, and

the experimental results obtained with this cable by connecting several circuits in series back and forth between Boston and Worcester justify the confidence of the engineers of the American Telephone and Telegraph Company that they will certainly solve, in the near future, the grand problem of the telephonic union of the great centres of the Atlantic coast. The same confidence is expressed by the engineers of the Siemens and Halske Company of Berlin in their work on the problem of telephonic communication between Berlin and London through a cable over 400 miles under the North Sea.

A side issue of this problem is the problem of establishing a satisfactory telephonic communication between any two important centres of a continent. The new principle of high-tension telephonic transmission, mentioned above, affords a satisfactory solution, provided, however, that the insulation of overhead wires can be maintained above a certain low limit. Investigations in this direction conducted by engineers of the American Telegraph and Telephone Company, and by the engineers of Siemens and Halske of Berlin, have yielded most satisfactory results, so that the question whether we shall soon have telephonic communication with San Francisco and other places on the Pacific slope, or between say St. Petersburg and Madrid, is merely a question of a sufficiently strong commercial demand.

The Wireless Wave Transmission Problem

The public is not yet on terms of familiarity with the wireless transmission scheme. The public is not quite sure that it knows who is the real representative of this new civilizing agent. Is it Marconi? Is it Tesla, or is it some one of the many other dark luminaries? Marconi used to be their wireless hero, but there have sprung up lately so

many champions of the cause of other inventors—and the courts have not spoken yet—that the public is somewhat puzzled. Under these conditions of uncertainty the public is not quite sure that the time has yet arrived to decide whether wireless transmission is essential to its present happiness. Besides, the gods of the Army and Navy departments have decided that wireless telegraphy is an essential element of their military equipment and the public must step back. The public can no more be allowed a free play with wireless telegraphy than they can be allowed to keep dynamite in their back yards or to steam about in torpedo boats. The war lords have spoken, and neither the inventor, nor the disappointed stockholder, nor the patent office dare open their mouths. When a United States general or admiral announces with all official solemnity that the scientists of the Army or Navy have devised a wireless method of their own and the intelligent public observes that not only this military wireless system but also that other alleged new wireless systems, recognized and patronized by the Government, and known as the Fessenden, De Forest, Slaby-Arco, Braun, and I do not know what other kind of systems, look in every particular like the familiar old Marconi system, they stand perplexed and ask,—well, who has invented what? For they must either all of them have invented the same thing and do not know the remarkable coincidence, or nobody has invented anything, or one man is the real inventor and the rest are bold-faced fakirs. Each one of these hypotheses seems equally improbable. This mixed-up state of affairs has produced a marked depression of public interest in wireless telegraphy, and consequently it has delayed quite seriously the progress of this beautiful new technical art. But fortunately for the art, it is so attractive that in spite of its associations with many apparently disreputable characters it is still cultivated by

serious men of true scientific spirit and devotion. These men know quite well that there is one wireless scheme only, that it is a clean-cut invention of the first order, and being such it is fairly certain that it belongs to one man only, the decrees of the Army and Navy scienticulists notwithstanding; and they also know that it devolves upon them and upon the original inventor, and not upon the scienticulists of the Army and Navy, to solve the present problem of wireless telegraphy, which they feel confident to be a true engineering problem, because its solution is quite within reach of the present state of the electrical art. This problem is: A rapid, reliable, and selective communication between the continents and any point on the Atlantic. A ship on the ocean should always be in electrical touch with land.

That which is needed is an oscillator, sufficiently powerful and persistent to produce strong reasonance effects. A wave-train consisting of say thirty complete waves is for all practical purposes as effective in producing strong reasonance effects as a continuous train.

In wireless telegraphy oscillators of a frequency of about one million oscillations per second are commonly used. To give a wave train of thirty complete waves the oscillator would have to maintain its vibrations during an interval of approximately one thirty thousandth of a second. An oscillator of this frequency and possessing a condenser of .1 microfarad charged up to 50 thousand volts would during that brief interval of time radiate energy at the rate of approximately 15 thousand horse-power. Assuming that the giant Marconi radiator has an area of 1000 square yards, there would proceed from every square yard during a time-interval of one thirty thousandth of a second radiant energy at the rate of 15 horse-power. The radiant energy sent forth into space by every square yard of the

bright surface of the moon, assuming even that it reflects all the sunlight which falls upon it, is sent out at the rate which is less, considerably, than one horse-power. Yet, although its distance from us is so enormous, our eye can feel its radiant energy even some time before the full moon has risen above the horizon and we can measure the relative amount of its radiation, sent to us, by electrical receivers which do not differ essentially from some forms of receivers employed in wireless telegraphy. This simple comparison shows what an intense source of intermittent radiation a Marconi radiator can be when actuated by a sufficiently powerful oscillator. A generator of 15 horse-power would be quite sufficient to charge such an oscillator a hundred times per second, which is sufficient even for the most rapid kind of ordinary telegraphy in actual practical use anywhere. Such an oscillator operating, say at Cape Cod, would very probably be felt at every point of the Atlantic between the European and the American coast, particularly on receiving circuits which are in reasonance with the oscillator. Such an oscillator has not yet been constructed and it may not appear quite clear how so much electrostatic capacity can be crowded into an oscillator of the enormous frequency employed in wireless telegraphy. Yet I feel fairly confident that the present state of the electrical science offers abundant means for doing the thing in a very simple manner and that it will be done in the near future. But I am afraid that when it is done the official back of the electrical cat upon which the military and naval scienticulists rely for their charging generator will curve up in mad disorder; there will be an interruption in the very important official wireless communications between naval stations, one requesting the other for a loan of a few yards of rubber hose. A session of the war council would probably be called to decide how this intolerable interrup-

tion of official business can be avoided, and after careful consultation with the military scienticulists the war lords would probably decree that the existence of such thundering machines on the sea-coasts is a public nuisance because it interferes with the wireless business as conducted by the scienticulists of the Army and Navy and required by the conditions existing in their administration. The wireless problem cannot become a true engineering problem so long as the war office interferes with a technical art of which it has no intelligent grasp. Soldier, stick to your guns; leave wireless telegraphy to people who can handle it with more intelligent grace and skill.

The Telegraph Problem

It is the most difficult electrical engineering problem before us. What is wanted is a system which will perform a large part of the work of the ordinary mail at any rate between thickly populated centres. That means very rapid, efficient, and accurate automatic machine sending and receiving. It also means multiplexing way beyond the performance of the present quadruplex. Theoretically the solution of the problem looks easily possible and actual experimental demonstrations have been given to prove the correctness of the inference drawn from pure theory. Mr. Patrick Delany's work in this particular direction should be honorably mentioned here. But very serious practical difficulties exist, which are known to those only who have been for a long time in actual touch with the telegraph business of this country. This business has developed historically; each epoch in its development marks an epoch in the development of the general business methods which prevail in this country.

In European countries, the telegraph belongs to the Government and its development was influenced very much by

the requirements of the war office. Private business had to accommodate itself to the telegraphic conditions created by these requirements.

To illustrate: Many of the trunk lines in this country are leased to private individuals, bankers, brokers, etc. The telegraphic companies do their own business over these leased lines, employing the quadruplex method. In fact not only the telegraph company, but several subscribers are working over the same trunk line simultaneously, each one, except the telegraph company, ignorant of the fact that the other fellows are using the same ethereal channel of communication. This practice is practically unknown in Europe.

It is the opinion of men of recognized ability, who have grown old in the development and management of the telegraph business in this country, that the numerous long-distance lines covering the vast territory of the United States are so costly, both from the standpoint of initial expense for construction, and also from the standpoint of subsequent expense for maintenance, that they would hardly pay if it were not for the rental of these lines to private individuals. The same statement holds good for the transmission of intelligence over long-distance telephone wires. These, too, are rented in very many cases to private individuals for telegraphic purposes, so that long-distance telegraphy and telephony are often carried on simultaneously over the same wires.

Any new improvement which would bring us nearer to the solution of the general telegraphic problem is impracticable if it interferes seriously with the existing conditions under which, according to the preceding rough sketch, telegraphic business is conducted here at present. This explains the well-known fact that several American inventions in telegraphy were adopted abroad and proved themselves

valuable, although they failed to find recognition at home on account of their inability to satisfy the requirements of the telegraphic situation existing here. The disappointed inventor can hardly be blamed for feeling sore over the apparent lack of appreciation in his own country. But if he could be prevailed upon to raise himself to a loftier level of objectivity, and thus obtain a broader view of the telegraphic situation at home, he would certainly be less severe in his criticism of what he considers to be the hide-bound methods of the antediluvian telegraphic monopolies which, in his opinion, smother every intellectual activity of inventive genius.

Those who are most familiar with the mathematical theory of transmission of rapid electrical impulses for telegraphic purposes seem to agree fairly well on one point at least; it is this: The alternating current is the most suitable form of electrical transmission for telegraphic purposes. The solution of the general telegraphic problem by means of automatic transmission, and by the adoption of multiplex methods with all the possible refinements of which these methods are capable, cannot be reached unless the alternating-current method of transmission is adopted. But then we should have in telegraphy the same practical difficulties which telephone engineers met in the early days of telephony. These difficulties are summed up by the telephone engineer and condensed into a single word,—cross-talk. It means conveyance of electric energy from one wire to another by electrostatic as well as by electromagnetic induction. It is the more powerful the higher the frequency of the alternating current employed in the transmission. The telephone engineer overcame this difficulty gradually by giving up the employment of the earth as the common return conductor for all his transmission wires, and from that day dates the symmetrical conducting

loop of the metallic return circuit. Having adopted this expediency it was then a comparatively easy matter to avoid cross-talk, due to induction, by a suitable transposition of the neighboring circuits with respect to each other.

The introduction of the alternating current into telegraphic transmission would compel the telegraph engineer to resort to this same expediency which was long ago adopted by the telephone engineer, otherwise he would expose himself to the serious difficulties arising from cross-signaling.

Considering the fact that practically all telegraph lines in the country employ the ground return, it is clear that the general introduction of the alternating current into telegraph work would involve practically a reconstruction of a large part of the vast network of telegraph wires in the United States. I do not know of a single telegraph engineer in this country who would have the courage to assume the responsibility of advocating before his board of directors a policy of this kind. And so, as far as this country at least is concerned, the solution of the general telegraphic problem seems to be a matter of the dim and distant future.

SOME PRESENT PROBLEMS IN TECHNICAL CHEMISTRY

BY WILLIAM HULTZ WALKER

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TECHNICAL chemistry may be regarded as the performance of a chemical reaction or series of reactions on a scale sufficiently large and by a method sufficiently economical to enable the product to be sold at a profit. The problems which confront the investigators in this field of endeavor may, therefore, be divided into two classes, according as they pertain to the chemical reaction involved or to the process to be employed in carrying on this reaction. The first division is pure chemistry, even though the results of the solution be utilitarian; the second is chemical engineering. Although in the Programme of this Congress, the utilitarian side of chemistry is widely separated from the subject of general chemistry, there is in reality no dividing-line between the two. It would be difficult to find an investigator in the field of pure science who does not hope, and indeed believe, that the results of his labor will at some time prove of value to humanity; may ultimately be utilitarian. On the other hand, few, if any, chemical manufacturers would admit that in solving their chemical problems they do not utilize the most scientific methods at their

command. The research assistant is in the last analysis utilitarian; while the successful chemical engineer is pre-eminently scientific.

Probably in no country have the problems confronting the chemical industries been so successfully met as in Germany; yet Germany does not excel in chemical engineers. Engineering enterprises, mechanical, civil, and electrical, as well as chemical, are carried on as successfully in England and America as they are in Germany, and still the latter leads the world in her chemical manufacturers. The explanation for this lies in the fact that Germany pays the greatest attention to the first class of problems, as above divided, and recognizes that pure chemistry is inseparably connected with her industries; that the application of new facts and principles follow rapidly when once these facts and principles are known. Most of her problems in technical chemistry are first considered as problems in pure chemistry and studied in accordance with recognized methods of modern research by men fully trained in pure science. If these men are also chemical engineers the ultimate solution of the problem is proportionately hastened; but they are first of all men trained in the spirit and methods of scientific research.

In general, an investigation may be prompted by either or both of two incentives; either by the pleasure to be derived from achievement and the love of scientific study for itself, or by the hope that from the investigation some immediately useful result may be obtained. Yet between the product of the first motive—pure chemistry—and the ultimate result of the second—technical chemistry—a difference does not necessarily exist. The fact that a piece of work is undertaken and carried on with the predetermined purpose of applying the results to a practical or commercial end does not in itself render it any the less a study in

pure chemistry. The method of thought and action employed will be that of the investigator in pure science, whatever the ultimate object may be. To make the result of the work an achievement in technical chemistry an important contribution must then be made by the chemical engineer, in order that the conditions forming the definitions of the term "technical chemistry" as already stated may be fulfilled. In trying to point out some of the important problems in technical chemistry, no attempt will be made to distinguish between the part which must first be played by pure chemistry in their solution, and that which will still remain to be done by the chemical engineer to make this contribution utilitarian.

There is always a tendency to measure the importance of a subject by the extent of one's knowledge of it and the depth of the interest one has in it. In order, therefore, that we may obtain a proper perspective, we must consider a problem important in proportion as it affects the greatest number of people; of moment according as the results of its solution will be far-reaching in their effects, or be but of local benefit.

From this point of view the first industry to demand attention is the manufacture of fertilizers. In the last ten years the product of this industry in the United States alone has increased from 1,900,000 tons to 2,900,000 tons, an increase of over fifty per cent. This increase is probably more marked in America than in the older countries of Europe, because the necessity of replenishing the virgin soil was there reached long ago, while with us it is only begun. The magnitude of the industries which are dependent directly or indirectly upon agricultural products is so well recognized that it needs no discussion here. That the supply of crude material from which plant-life derives its nourishment should be maintained is therefore a source

of responsibility for the present, as well as for future generations. Of this, as of every great industry it may be said that the supply of raw material for to-morrow is a problem for to-day.

Dr. H. W. Wiley, of the United States Department of Agriculture, has pointed out the surprisingly large amount of potash, phosphoric acid, and nitrogen which is yearly taken up by the agricultural crops alone. The average percentage of ash in all of the important crops has been accurately determined and their percentage composition in respect to potash and phosphoric acid is known. In addition to this we have a satisfactory knowledge of the percentage of albuminous matter contained in the more important agricultural products. From these figures and the reports of the United States Department of Agriculture we can calculate the amount of potash, phosphoric acid, and nitrogen consumed each year. Allowing a value of 4 cents a pound for potash, 5 cents for phosphoric acid, and 12 cents for nitrogen, the total value of these ingredients for a single year amounts to the enormous sum of $3,200,000,000. To be sure this is not all removed from the farm and lost to the soil; but that which remains in the form of straw and manure is but a small percentage of the whole. Straw is generally burned, while the soluble salts of the manure-heaps are often allowed to leach out and go to waste. When in addition we consider the terrible waste involved in the modern methods of sewage disposals where, instead of being returned to the soil, these valuable constituents are carried to the ocean, the net loss of these chemicals can be easily appreciated.

Of these three most important ingredients making up a fertilizer for general purposes, phosphoric acid alone seems to be at hand in practically inexhaustible quantities. Slag, rich in phosphoric acid from certain metallurgical processes,

is already much used as a source of the material. Fresh deposits of phosphate rock of such enormous extent are being brought to light almost every day that our supply of this material may give us little immediate concern.

Although the Strassfurt region of Germany may continue to ship undiminished quantities of potash salts, the second important ingredient of a fertilizer, the world's supply cannot be said to be on a perfectly satisfactory basis until independent sources are developed. In the year 1902 the value of the potash salts imported into the United States amounted to $4,500,000. The recovery of potash from wood ashes, while once an important industry, must diminish as the value of hard wood increases. While there are doubtless natural beds of potassium salt still to be discovered, the time seems rapidly approaching when we should render more readily available the great amount of potassium distributed throughout the mineral kingdom. Rhodin had already accomplished much toward this end when he showed that feldspar could be made to yield the greater part of its potash when it was heated with lime and common salt. Clark has found that when the mineral leucite, with its 21 per cent potassium oxide is heated with ammonium chloride, the potassium is converted into chloride and is easily separated from the melt. If this reaction could be extended to orthoclase and the ammonia recovered by treatment with lime, the enormous quantity of potash contained in this mineral would be at our service.

It is, however, to the supply of available nitrogen that the greatest importance attaches. The sodium nitrate producing countries of South America exported last year 1,300,000 tons, a large percentage of which came to America. Egypt and the Southwestern United States have nitrate deposits, but of their extent and value little is as yet known. Of the other form of available nitrogen, ammonia,

our main supply is at present from the destructive distillation of coal. Although the introduction of by-product coke-ovens has increased this supply, our domestic production is now not over 40,000 tons a year.

In the atmosphere, however, we have a never-failing source of nitrogen which needs only to be converted into other forms to be of the greatest value. It is interesting to note that even as long ago as 1840 this same problem was the subject of considerable experimentation and the basis of several technical processes. In this year there was erected in France a plant for the manufacture of potassium ferro-cyanide, which depended on the atmosphere for the supply of nitrogen, and which at one time turned out almost a ton of product per day. From this time until the present, the utilization of this inexpensive and inexhaustible supply of raw material has been an attractive field, and has held the attention of many investigators. It had long been known that while carbon and nitrogen alone could not be made to unite, the union was effected when these elements were brought together in the presence of a strong alkali. The technical difficulties in the way of successfully applying this reaction seem to have been the rapid destruction of the retorts and the loss of alkali through volatilization. With the advent of cheap electricity and the consequent development of the electric furnace, this idea was made the basis of further work. The destruction of the retorts was largely overcome by generating the heat within the apparatus rather than without. When a non-volatile alkali was used to eliminate the loss from this source and a higher temperature maintained, it was found that a carbide was formed as an intermediate product and that nitrogen readily reacted with the carbon thus held in combination.

Among the investigators who have thus far taken advantage of this reaction may be mentioned the Ampere

Chemical Company located at Niagara Falls, and the group of men represented by the Siemens-Halske Company of Berlin. The former first produces a carbide of barium and then converts it into barium-cyanide by passing over it air from which the oxygen has either been removed or converted into carbon monoxide. Robert Bunsen long ago showed that by using steam the nitrogen in all alkaline cyanide may be converted into ammonia. In this case barium oxide would be left to be returned to the furnace, and to continue the cycle. When advantage is taken of the process discovered by Professor Ostwald, by which ammonia is converted into nitric acid through the medium of a catalyzing or contact agent, the production of nitrates by way of the cyanide reaction is easily foreseen.

The Siemens-Halske Company prepared, in addition to cyanide and ammonia, by use of the carbide-nitrogen reaction, a new compound in technical chemistry, calcium cyanamide. In contradistinction to the cyanides the nitrogen of this compound is available for plant-food and can take the place of the more common nitrogen salts in commercial fertilizers. The technical difficulties in the way of the economic application of these processes are doubtless very great, but when one considers the advance which has been made in the last five years he has ample reasons to believe that it will not be a great while before the synthetic preparation of the cyanides, ammonia, and nitric acid from atmospheric nitrogen will be on a commercial basis.

The old reaction by which nitrogen and oxygen were made to unite through the agency of a high potential electric discharge has been made the basis of a process for the manufacture of nitric acid by the Atmospheric Products Company, operating at Niagara Falls. For agricultural purposes it is proposed to absorb the nitric acid thus formed in milk of lime, and so produce an exceptionally cheap prod-

duct. There still remains much to be done before this can be called a technical process.

A very much less technical, but, so far as our knowledge at present goes, a more promising method of fixing atmospheric nitrogen in the form of nitrates is through the agency of bacteria. While it is true that one group of bacteria has the power of breaking down nitrates with the production of nitrogen gas, there are other groups which are equally able to absorb elementary nitrogen with the production of nitrates. A great deal of excellent work has recently been done by the United States Department of Agriculture with the result that cultures for the artificial inoculation of the soil may now be obtained in considerable quantity. It has been found that these bacteria when grown upon nitrogen free media may be dried without losing their high activity. When immersed in water they are easily revived. A dry culture similar to a yeast-cake, and of about the same size, can thus be sent out and used to prepare a fluid in which the original nitrogen-fixing bacteria may be multiplied sufficiently to inoculate a number of acres of land. The amount of material thus obtained is limited only by the quantity of the nutrient water-solution used in increasing the germs. Field experiments have shown the wonderful activity of these bacteria in fixing atmospheric nitrogen and the splendid crops which may be grown upon what would otherwise be almost sterile soil.

In this one problem of our future supply of available nitrogen for agriculture as well as general manufacturing purposes, we note the aid which technical chemistry draws from the other departments of natural science. The electrical engineer and biologist have already contributed a great share in its solution. There remains, however, no small amount of work for the technical chemist to perform before the desired end is reached.

In an address on "Chemical Problems of To-day," delivered by Victor Meyer in 1889, the author pointed out that, although the synthesis of starch from carbon dioxide and water was a result not to be expected in the near future, yet, he says, "we may reasonably hope that chemistry will teach us to make the fiber of wood the source of human food." While we do not consider that this is a problem of technical chemistry for the present, the possible use of cellulose as a raw material from which to make food, renders more acute a problem which is to-day clamoring for solution, namely, the preservation of our forests. The influence which the forests of a country have upon its civilization is a topic which has been much discussed of late. That there is an intimate relation between the woodland of a district, and the regularity of its rainfall, the absence of floods and freshets, and the general climatic conditions, there seems now to be little doubt. But the consumption of forest products continues to increase far out of proportion to the growth of new timber. The substitution of other raw material in chemical industries which now use wood for this purpose becomes, therefore, an economic problem for the solution of which the chemist is held responsible.

The production of cellulose from raw materials other than wood is the first important factor in the chemical side of the question. The weight of wood consumed for the production of chemical fiber for the year 1902 was something over two million tons, while one and a half million tons were used for the manufacture of ground wood-pulp.

While from some points of view our American forests are sufficient to supply the demand for many years to come, it does not excuse us for the terrible waste of cellulose in forms other than wood, which we are constantly suffering.

On our flax-fields of the West we are annually burning

thousands of tons of flax-straw which contains a large percentage of cellulose in a most valuable form. Considerable work has already been done on the utilization of this straw in the production of fiber, and some success has met the efforts of the By-Product Paper Company, now located at Niagara Falls. There is, however, still much room for improvements. In the straw of our wheat and oat crops, which is to-day largely destroyed on the fields, we have another source of cellulose of which we avail ourselves but little. In Europe the production of straw fiber is carried on to some extent, but is capable of great extension should sufficient economy in the process for treating it be introduced. The high content of silica has ever been a source of loss, owing to the fact that the formation of sodium silicate prevents the recovery of the soda now used in the digestion of the straw.

By far the greatest loss of valuable cellulose, however, is found in waste cornstalks and in bagasse or the sugar-cane after the soluble portions have been removed. There is a close analogy between these two products, in that there is associated with the woody portion carrying the cellulose a large amount of non-usuable pith. Rapid progress has been made in the utilization of both of these raw materials within the last few years, and the indications are that before long they will prove a source of value rather than a nuisance, as is frequently the case at present. The market price of bleached cellulose fiber is today from 2½ to 3½ cents per pound. Starch may be bought for from 2½ to 4 cents, according to its source. It is seen, therefore, that there is little manufacturing margin in the conversion of cellulose to starch or sugar until the cost of the former has been considerably reduced. This can come about only through new processes designed to operate more economically than those at present in use, and to use as raw products the cellulose at present wasted on the fields.

It would seem that a more economical step toward the production of food from wood might be through its ligneous or non-cellulose constituents. For every tone of cellulose produced there must be used two tons of wood; that is, an equal weight is wasted. In the soda process, as now conducted, these non-cellulose materials are burned to recover the soda which is held in combination with them. In the sulphite process this enormous amount of material, aggregating for America alone in a single year almost one million tons, finds its way into the water-courses and ultimately to the ocean. This organic matter is most complex in its composition, but consists largely of one class of substances closely allied to the sugars, and another class having the general characteristics of tannins. That these sugar-like substances could be made to yield a food material is, from their nature, quite possible; so far as we know, however, but little has been accomplished in this direction. A number of uses have from time to time been proposed for this waste, but as yet none have been of practical value. Among the more promising may be mentioned a preparation to be used in tanning leather, a sizing material for paper, and a substitute for dextrine in calico printing, and as an adhesive.

In addition to our annual supply of 4,000,000 tons of paper stock, we depend upon the forests for our supply of acetic acid, methyl alcohol, and acetone. In countries where there is not the exorbitant tax upon fermented mash that exists in the United States, there would seem to be an opening for a process for the production of acetic acid from alcohol in a more concentrated form than can be produced through the aid of *mycoderma aceti*. It would, it is true, in the end depend upon the supply of fermentative material; but there are being wasted every year in the semi-tropical countries many thousand tons of crude molasses that could

thus serve an economic end. For many uses acetic acid may be displaced by formic acid, a compound which admits of synthesis from carbon and water. The farther this substitution is carried the more acetic acid will be available for the manufacture of acetone and other compounds where the acetyl group is a necessity.

Concurrent with the disappearing forests is the increasing scarcity of vegetable tanning material. Hemlock and oak bark, sumac and chestnut wood are still the most important sources of tannins, although quebracho from South America and canaigre from Mexico and Texas are daily playing a more important part. The introduction of chrome tannage for upper leathers had a marked influence upon this industry, inasmuch as it furnished a cheap substitute for those finer tanning materials which are constantly increasing in price. A mineral tannage for heavy hides, along the lines so successfully followed for upper leather, has, however, not been developed; the product lacks the rigidity and firmness combined with the flexibility which is characteristic of oak or hemlock tanned leather. There must exist methods for supplying to the hide materials having an action analogous to these vegetable tannins; it remains but to seek them out in order that a new and profitable industry may be established.

It is thus seen that technical chemistry can do much for the conservation of our forests; along many lines the time for action has already come.

When the consumption of a given article is in excess of its supply, the market price must rise. In accordance with this law we have seen the price of crude India rubber more than double in the last few years. The consumer of the finished article must pay this advance or accept an inferior grade of goods. Generally he does both.

The tropical forests of Africa and South America still

contain untold quantities of India rubber; but so does sea-water contain gold. For manufacturing purposes both might as well not exist. The only human beings that can live under the conditions obtaining in these tropical jungles are the natives; but the distance to which the natives can transport the rubber is comparatively limited. Although rubber-bearing trees are now being cultivated in the more easily inhabitable portion of the tropics, it will be a long time before this source of supply is an important factor in the market. And thus it comes that the synthesis of India rubber presents to-day from at least the technical side, one of the most promising problems in chemistry.

The investigation of India rubber is greatly handicapped by the fact that it exists only in the colloidal state. The difficulties are perhaps more largely physical than chemical; that is, it is the molecular aggregation rather than the atomic structure of the individual molecule which presents such almost insurmountable difficulties. There are no clearly defined melting-points, boiling-points, tendencies to crystallize or any of those means of separating mixtures or characterizing individuals which aid in the investigation of most organic compounds. The researches of Weber and Harries, resulting in the establishment of the much-needed methods of analyses, have been of incalculable advantage to all those working with either the raw or the manufactured article. In many directions also, the paths along which important results are to be obtained have already been blazed by these investigators. Probably no other field presents such difficulties of manipulation, in addition to such profound problems of organic chemistry, as does the investigation of India rubber; but on the other hand, few such unlimited opportunities for valuable work are offered in the field of chemical research.

Under the general head of utilization of trade-wastes

may be considered a large number of technical problems, the solution of which would not only add wonderfully to the economic resources of the country, but would aid in the solution of that much vexed question, river-pollution. We have already mentioned the soda and sulphite liquor resulting from the manufacture of cellulose fiber from wood. Of almost equal importance is the waste yeast which is daily produced in the brewing of beer and ale. An extract of this yeast has a food value, as shown by analysis, equal to the best meat extracts. As the quantity of yeast allowed to go to waste is from one to two pounds for every barrel of beer brewed, we can form estimates of the great amount of this material at hand. Arsenic sulphide from the purification of crude acids, grease from the washing of wool, the utilization of city garbage and many other problems of this order are everywhere in evidence. It is not within the compass of this discussion to mention these almost innumerable sources of manufacturing waste which exist in the chemical industry; but keen competition on the one hand, and the State Boards of Health on the other, are constant stimuli to increased effort toward their utilization.

Although I have endeavored to select the above examples of unsolved problems with a view to touching upon as large a portion of the field of technical chemistry as possible, I could doubtless, with equal propriety, have selected others. We can simply mention such important questions as the hygienic preservation of food, the flame-proofing and preservation of wood, prevention of the corrosion of structural iron and steel, the great problems of chemical metallurgy, etc. We must, however, note some of the more recently developed forces and phenomena of nature, the application of which to technical chemistry forms problems for today. One of the most important of these is electricity. Thanks

to the triumphs of modern electrical engineering we are now able to call to our aid unlimited amounts of this agent at a cost comparable to that of other forms of energy. Possibly the simplest, though not the earliest method of utilizing electrical energy in chemical processes is in supplying the heat necessary to carry on a reaction directly at the point where the reaction takes place. In a number of chemical industries (for example, the manufacture of phosphorus) it was previously necessary to produce within thick-walled retorts a very high temperature. The result was that a great deal of heat was wasted, the retorts deteriorated very rapidly, and the reaction was carried on at a low efficiency. By using an electric furnace for the manufacture of phosphorus these expensive retorts are eliminated. In addition much cheaper raw materials may be used, the process is made continuous, and a high efficiency obtained. By the substitution of electrical heating for the closed retorts previously used in the preparation of carbon bisulphide the manufacture of this chemical has been placed upon an entirely new basis. The economy introduced by supplying the heat at the point where the union of carbon and sulphur takes place is clearly indicated by the low price at which this material can now be sold and its enormously increased consumption.

With the ability to obtain temperatures far above that which is possible by the ordinary combustion of fuel, there was opened up a new field in synthetic chemistry. Reactions which it was impossible to carry out on a technical scale, and others, the existence of which was not suspected, have now, through the application of electrical energy, become the bases of large manufacturing enterprises. Calcium carbide, carborundum, artificial graphite, and many hitherto unknown alloys are the commercial products of the electric furnace where temperatures in the neighborhood of 3000° C. obtain.

The third and more strictly chemical application of electrical energy is in the use of the current for electrolysis. Faraday long ago determined the laws according to which chemical compounds break up when subjected to the passage of an electric current. It is only in recent years, however, that the cost of electrical energy has made it possible to apply the knowledge thus furnished by this great investigator. Among the many important advances due to this use of electricity may be mentioned the manufacture of caustic soda and bleaching powder by the electrolysis of brine. The percentage of the world's supply of these two standard articles, which is now made by this process is already a formidable figure, and constantly increasing. In the electrolytic production of aluminum we have seen an entirely new industry develop, until it is now one of magnificent proportions.

What the application of electricity will do for technical chemistry in the future can be predicted only by estimating the results of the past. In many fields it is practically virgin soil over which only the pioneers have trod, and which is still waiting to be tilled.

Under the name of catalysis or contact action is included the other force that we can mention this afternoon, the usefulness of which the technical chemist is only beginning to appreciate.

These substances which are capable of so wonderfully increasing or decreasing the speed of a reaction without themselves appearing in its final products vary in their nature from such simple ones as metallic platinum or ferric oxide to the most delicately constituted ferments or enzymes. The manufacture of concentrated sulphuric acid by such a process is perhaps the most striking example of the application of this idea, although, to be sure, the finely divided platinum used at present plays but the rôle which

the oxides of nitrogen have done so successfully in the past. The reproduction of photographic negatives by substituting for the action of light on sensitized paper the contact action of certain chemical compounds, is a process worthy of its distinguished discoverer, Professor Ostwald. For this application of catalysis even the most pessimistic must prophesy a great future. Still another phase of this question is found in the hydrolysis of fats by the enzyme found in the seeds of the castor-oil plant. Instead of the application of acid, heat, and pressure the same result is obtained at room temperature by the quiet action of this catalytic body. The advantages to be reaped by the development of these phenomena can scarcely be foreseen. Even the wildest dreamer might easily do injustice to the possibilities of this wonderful agent when intelligently used by the technical chemist.

We probably should not invite criticism were we to state that wherever we find a manufacturing establishment based upon chemical processes, there also exist problems in technical chemistry. That one factor which is so apparent that it scarcely needs mentioning, namely, the increase in the yield of processes now in operation, is enough to substantiate this assertion. The paramount question before us is therefore how can these problems best be solved. In any answer to this question there are two factors both of which deeply affect the future growth of chemical industry. The first is the attitude of the manufacturer towards science and scientific work; the second is the training of the coming chemist.

When a few years ago England awakened to the fact that many industries in which she was the pioneer and at one time the leader were in the main passing to other countries, there went up a great cry for "technical education." The nature of the industrial stimulus which has borne such mag-

nificent fruit in Germany was not understood. In the minds of many a panacea for all their difficulties was to be found in the technical education of the working classes. But this is unquestionably a mistake. Until there is a love of science for its own sake and an appreciation of the value of scientific method among the leaders of chemical industry, the fruits of technical education cannot be reaped. Carl Otto Weber, speaking of this move toward a more general scientific education in England, says: "Until the nation, as a whole, recognizes that the prosecution of scientific study as a mere means of money-making is a profanation defeating its own end, the history of industrial developments in England will afford the same melancholy spectacle in this as in the last century, technical education notwithstanding."

The time is past when a factory can be run by rule of thumb; when the chemist is looked down upon simply as a testing-machine to be kept at a distance and generally mistrusted. It is true that there are many men to-day who pass under the name of chemists who are little more than testing-machines; men who possess the ability to do nothing more than the most strictly routine analysis; but such men will never solve the technical problems of the present or any other time. I would not impugn the dignity or intrinsic value of analytical work—it is the corner-stone of all chemical investigation. But I would emphasize the fact, for it is a fact, that the manufacturer who employs a so-called chemist, one trained to "do" coppers or carbons, or acids, and who at the same time expects this chemist to improve his process and keep his business in the skirmish-line of the industrial battle, must eventually be numbered among the "not accounted for."

The second factor in this answer is the training of the coming chemist. What is the reply to that now so oft-

repeated question: What is the best preparation for a technical chemist? I am personally of the opinion that it is not to be found in the teaching of applied chemistry as this term is generally understood. This training must provide for something more than simply copying the present—doing as well as others do; it must build for the future. We must provide men who are prepared to solve the unsolved problems. Within the last few months much has been said and written in America about the lack of adequate instruction in technical chemistry in our universities and colleges. It is assumed that American industries, based on chemical processes, do not flourish for lack of men trained in this branch of science. This, however, is not the case. It is not more instruction in applied chemistry that America needs, but rather a deeper and broader knowledge of pure chemistry with a more extended training in original research.

In many of the problems we have already noticed, the solution depends upon the discovery of new compounds—the investigation and study of new reactions and relationships. This is the province of pure organic and inorganic chemistry. The foundations of these two departments cannot be too firmly or too broadly laid. The method of attack best followed in each cannot be too well understood. But it is not sufficient that we study only the initial and the final products. It is all important to learn the influence of the variable factors on the process; to study the reaction for itself. This is the province of physical chemistry, a department of science, the importance of which to technical chemistry cannot be overestimated. To be able actually to apply the laws of chemistry and to predict the course of reactions from general principles already proven is a tremendous economy of both time and energy.

After we have acquired the tools, however, we must learn

to use them; after we possess a sound knowledge of inorganic, organic, and physical chemistry we must have adequate training in work requiring original and independent thought.

As I have already noted, the training to be derived from an investigation may be the same even though the incentive for its undertaking may be different. While I believe that so far as possible the student should be influenced to work for the love of knowledge and for the mastery of science for itself, yet especially in his later years of study there are advantages in allowing him to combine with this an utilitarian aim. In America, at least, most men enter our technical schools with the intention of fitting themselves as rapidly as possible for some useful calling in life. They have a feverish desire to get through and to enter the creative industries and accomplish something. They will work with enthusiasm upon whatever they can be made to recognize as contributing to this end, but by their very directness are intolerant of supposed digressions from their chosen path. The presence of too much of this spirit is to be regretted; but it is a power to be turned to service, not to be opposed. It does not follow that for a training in scientific method and for broadening the mental horizon a research which can have little, if any, practical value is superior to one, the solution of which can find immediate application. For advanced work, as much pure organic chemistry, for example, can be learned from an attempt to convert safrol into eugenol (a consummation in itself devoutly to be wished) as in the transformation of some other compound with a much longer name but with no higher destiny than to fill a place in Beilstein. So also in physical chemistry. A careful, painstaking investigation of some of our already established industrial processes with a view to determining the maximum yield at the minimum cost is of

the greatest educational value. In other words, a problem for research may have a distinctly practical bearing without being any the less a study in pure science, or without having thereby an inferior educational value.

In other problems, we have noted, the solution largely depends upon the process, not the reaction. This demands the chemical engineer, a man who combines a broad knowledge of chemistry with the essentials of mechanical engineering. He must be well schooled in the economics of chemistry; have a knowledge of the strength and chemical resistance of materials; be able to design and operate the mechanical means for carrying out on a commercial scale the reactions discovered, and duplicating the conditions already determined.

All this training cannot be combined in the one man who takes a four years' college course. Either he must study an additional year or two, or he must replace some of his chemical work with mechanical engineering. But such a man must contribute a great share in the ultimate success of chemical industries, for on him depends the solution of the problems comprising the second division of our subject.

With men whose foundations are thus broadly and deeply laid, anxious to enter the industrial arena, and with a generous appreciation of the scientific man on the part of the manufacturer, coupled with a willingness to grant him an adequate return on the money invested in such an education, the problems in technical chemistry of the present must rapidly become the achievements of the past.

THE RELATIONS OF AGRICULTURE TO OTHER SCIENCES

BY CHARLES WILLIAM DABNEY

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THE subject assigned me is Agriculture in Relation to Science. For this subject, almost cosmical in its vastness, I offer no apology, but ask your indulgence while I attempt to point out a few of the achievements of the new agriculture and to show their relation to the advancement of civilization. While the progress has consisted partly in opening up such lands as are not highly cultivated to people who can cultivate them, its chief progress has been in the improvement of man's methods of cultivating the soil and of using plants and animals to support his ever-increasing numbers. Since population is increasing rapidly and more food is required each year to support the life of the people born into the world, unless the production of food becomes greater in proportion to the unit man and the unit acre, starvation awaits the race. In 1899 Sir William Crookes argued seriously, before a meeting of the British Association, that the world's wheat-supply is already threatened by the failing fertility of the available soil. As the low average of less than thirteen bushels per

acre means starvation for the rapidly increasing population of wheat-eaters, when he found the limit of available wheat-lands nearly reached, he saw no hope for the race except by increasing the fertility of the soil

Man has, however, shown a wonderful ability to utilize the different food-materials and to produce increased supplies from a limited area when he has been compelled to do so. The Harlemer polders support nearly two and a half persons to the acre, and in portions of China and Japan five or six persons often get their living from this extent of soil. These lands, however, are exceptionally fertile. But even on an average acre of land, where the ordinary farmer would make only five dollars' worth of produce, gardeners can easily make five hundred dollars' worth. For these and many other reasons we cannot be very much alarmed about mere food for the race.

It is a narrow view of agriculture, however, which regards this great art only as a means of providing men with the simplest means of existence. We are interested in the progress of agriculture not only as the means of supplying the food necessary for the increasing peoples of the earth, but as the art which chiefly supports man's advancement along all lines, intellectual, moral, and spiritual, as well as physical. "Man shall not live by bread alone." It is a condition of civilization that man is not satisfied with a mere subsistence, but that his wants increase with his development. The modern man is not satisfied with the simplest food or the plainest raiment, or the barest shelter. He wants attractive and delightful food, because such food promotes health, happiness, and the development of his finer nature. Hence there have been developed the various special branches of agriculture and horticulture and the many arts of milling, manufacture, preparing, and preserving the products of the soil so as to make food-sub-

stances tempting and delicious, as well as convenient for use. The American people, for example, owe much of their success as purveyors to the clever methods of preparing food-materials of all kinds, and to their skill and taste in presenting them to the public. It is not enough that quantity alone should be considered, for, in these days, quality plays an increasingly important part in food-production. Hence the arts of producing choice meats, "hygienic milk," cereals of greater food-value, etc., which arts may properly be termed the "higher agriculture;" hence also the arts of pomology, viticulture, etc., with the resultant practical arts of wine-making, canning, and preserving, which may be properly considered as a "higher horticulture." These arts, with the important domestic art of cooking, have all been developed in response to man's demand for more refined and delicious food, a demand which is certain to grow more exacting with the progress of civilization. The same law of progress characterizes our demand for raiment and for shelter. With the development of the esthetic sense and the growth of truer ideas of hygiene and comfort, the demand for more beautiful clothing and more sanitary houses will grow steadily.

But this is not all that can be said about the higher results of the new agriculture. Progress in agriculture contributes largely to the intellectual, moral, and spiritual development of a people, as well as to their physical evolution. Perhaps the most encouraging characteristic of the times is the improvement in farm-life in respect to the means of culture. Formerly the isolation and loneliness of country life was the chief cause of that exodus from country to city which until recently continued to depopulate our rural communities. It is a sad fact that the majority of the inmates of our insane asylums in these states are women, a large per cent of them farmers' wives, sent

to the hospitals as a result of melancholy induced by the narrowness and monotony of their lives. But now all these conditions are improving. The consolidated school and free transportation of pupils is fast converting the little "red schoolhouse" into a centre of vital community life. The rural free delivery of mails takes not only the letters of friends, but the daily papers and illustrated magazines, into all the farm-homes; the telephone makes visiting easy for lonesome women; and the traveling library stimulates many to improve their minds, who would otherwise live in stupid ignorance. Many of the features which formerly made farm-life so distasteful and narrowing, even maddening at times, are thus being removed; and many of the advantages, which heretofore could be had only in the city, are being put within the reach of those who spend their lives on the farm.

Every one concedes in a general way that the prosperity of one class diffuses itself throughout the whole community; but good harvests are far more valuable and important to the people than prosperity anywhere else. Agriculture not only provides food and raw material for those engaged in manufacture and commerce, but good harvests increase the purchasing power of the largest and most intelligent body of our citizenship, scattered throughout the whole land. The relation of the farmer to the merchant, the miner, and the manufacture, is indeed a reciprocal one. Each consumes what the other produces. In the circle of trade, whatever produces a demand at any one point accelerates the amount and velocity of exchange in all directions. Good crops, by supplying the manufacturer, merchant, and miner with food or raw materials, are, the world over, the chief factor in profitable exchange.

But abundant harvests signify even more than this. Every series of exchanges must have a beginning, and the

first step in starting the movement of products must be taken by those who supply the elementary and vital wants of the race. The miner will dig no ore, the manufacturer make no machinery, the merchant store no goods, until he knows or thinks he knows that somebody wants these things; but the farmer, being very sure that everybody wants food at all times, is sure to plant and to reap, whether there is an expressed demand for his produce or not. The nature of the demand, it is true, will decide for him which seed he should sow and whether on one or two acres; but sow he will, as surely as the spring comes; and when he sows, he is almost certain to reap. As nature does more work for the farmer than for any other producer, he finds it easier to turn out an almost regular supply of his products. The sun himself is the commander-in-chief of the agricultural army. The changing seasons order the farmer's plowing, sowing, and reaping, and fundamentally every series of human exchanges starts with the farmer.

Good crops are always and everywhere makers of good times. While this is true for all peoples and all lands, it is particularly true of America, which from natural causes is the greatest agricultural country in the world. In this country agricultural prosperity touches, and for a long time to come will continue to touch, the lives and interests of a larger proportion of the people than in any other land. It causes immediately an advance in the standards of living and a broadening in the scope of the demands of the largest number of intelligent, progressive people; and it produces a home market of such tremendous proportions as to furnish independently of foreign nations a sufficient motive for the development of gigantic manufactures and enormous trade. Further the American farmer is a man of so much intelligence and such large wants that his standards

of living increase very rapidly with the improvement of his financial condition. He is liberal to his family, ambitious for his children, and he desires above everything else to raise their standard of living and to increase their advantages in all ways beyond those which he himself enjoyed in his youth.

Another cause of the great economic influence of the American farmer is found in the fact that as a rule he owns his own land. In addition to the profit upon his labors he receives the rent on his land. This not only puts a larger sum at his disposal, but it also creates a motive for additional expenditure for improvements and equipments upon that land. The American farmer, moreover, seldom hoards his money, but promptly expends his surplus for improvements, or else puts it in the bank, where others can use it. He is, all things considered, the wisest and safest investor among us, and his prosperity is therefore the greatest blessing that can possibly come to the nation. Our conclusion is thus that the progress of agriculture is the greatest practical concern of civilized man, and especially of the American.

We have found that the problem of agriculture is to produce more and better supplies for the support of human life under conditions that will enable the farmer and his family, and with them the people of the whole country, to live the happiest and most complete life possible, a life which, as the decades and centuries pass, shall be constantly expanding, strengthening, and growing deeper and richer. The question, then, is "How shall agriculture do this?" What prospect is there that this art shall be able to supply these ever-increasing demands, not merely for food to keep the body alive, but for all the resources needed to support a life growing ever more true and beautiful? What encouragement, then, can we find in recent progress,

for believing that this world-old art will improve with the years and the demands of the race?

The improvement of agriculture depends, of course, upon the soil, including location as to latitude, longitude, climate, etc., upon the plants and animals used; but most of all, after these things are provided, upon the farmer and his methods. The most we can do here is to give a few illustrations of the advances made in recent years in improving the soil and increasing its fertility, in developing plants, and in training the farmer himself and improving his methods. We hope in this way to give some idea of what we may expect to accomplish in the future for the advancement of agriculture.

Agriculture, the oldest of the arts, was the very latest to apply the discoveries of science. This is due to two causes. In the first place, agriculture is the most difficult of the arts, and involves, one way and another, directly and indirectly, the application of all the sciences. Secondly, its workers have in the past been less trained in scientific methods than those in other callings. Until recently agriculture has been almost wholly an empirical art and only in very recent times has the farmer received any special training for his profession. Always intensely conservative he has learned new methods very slowly. Many breaches have, however, been made in the wall of empiricism which has surrounded him for centuries and the farmer who formerly derided book-farming has now opened his mind to the lessons of science.

Since the farmer commenced to use the teachings of science, the progress of agriculture has been extremely rapid; and as we may expect that agriculture will make gigantic strides in the next decade, the new agriculture, which is based on science rather than empiricism and which is just now being introduced, is destined to advance all the other industries and give the race a new forward impulse.

This we must believe from the progress already made. Consider, for example, the progress made since the time of Liebig in the study of soils. Liebig based all his proposals for the conservation of fertility and the improvement of the soil upon chemical composition, and his teachings did much to improve our agricultural methods. According to his theory the soil was composed of dead, inert matter, and the question was how to provide the so-called mineral food of plants in sufficient quantity and available form. For fifty years all methods of soil improvement and culture were based upon this idea. The soil was supposed to be devoid of all vitality until the crop appeared, and the chief business of the farmer was to destroy every other form of life. The question of nitrogen-supply had come to be looked upon as lying at the very foundation of agriculture and demanding the most careful consideration because the conditions of life in the civilized quarters of the globe were thought to cause a constant loss of nitrogen. Every collection of animals, brute and human, was destroying the combined nitrogen-supply; every town and city was dissipating enormous quantities of it through its sewers and into the atmosphere. Tons of this valuable element were being burned in explosives, and nitrates enough to grow bread for a whole city were being destroyed in single battles. At one time there were many who, like Sir William Crookes, predicted a nitrogen famine in the soil which in time would lead to a bread famine throughout the world.

One does not have to read far in the agricultural literature of to-day before finding that all these ideas have been entirely changed. The soil is now known to be filled so completely with living things as to entitle it to be considered a vital mass itself, and even those elements in it not endowed with life now have the highest significance as the necessary environment of the living organisms which they

help to nourish. We know that there are countless organisms in the soil, rendering many different kinds of service in preparing it to be the home of the plants, and, what is more important, in preparing the food for the plants themselves. Some of these organisms dissolve the mineral matter of the soils, others exert their activity on the organic nitrogen in the humus of the soil; others develop parasitically or symbiotically with growing plants, like the legumes, herding in colonies upon their roots and securing by their vitality, in a way we do not fully understand, the oxidation of the free nitrogen of the atmosphere. Still others have the ability, independently, apparently without the aid of plant vitality, either to secure the oxidation of atmospheric nitrogen or to produce ammonia. Investigations along these lines, which have now led to the systematic distribution of nitrogen-fixing bacteria for inoculating the soil, have, for a time at least, dispelled all dreams of early famines, and have given the world an assurance of a sufficiency of bread for at least an indefinite period. The refined scientific investigations of Nobbe in Germany have now been made practically effective in fixing nitrogen in the soil. Soil or seed can now be inoculated with the nitrogen-fixing bacteria just as dough is inoculated with yeast.

Mention might also be made in this connection of the proposals to combine the nitrogen and oxygen of the atmosphere by the electric spark, as is now being actually attempted at Niagara. Definite reports of results are not yet obtainable, but if this can be done on a large scale, we shall be able to utilize the great water-powers to make this valuable food for plants from the inexhaustible stores of the atmosphere.

Great progress has also been made in this country in the study of the physics of the soil, with the result that vast new areas, like the alkali soils, are being reclaimed; and

crops have been found for many other soils which were supposed to be useless. The proper comprehension of the relation of the soil to moisture has expelled many of the empirical methods of culture, and has given us a new conception of the meaning of tillage. The same may be said of the relation of the soil to heat.

The main object in all farming being the production of larger yields and better quality of crops, scientific men have given a large share of their energy in recent years to investigations having these objects directly in view. This work has included the testing of field-crops, fruits and vegetables, for the purpose of finding those best suited to given regions and conditions; the improvement of methods of culture, the production of improved varieties by selection and breeding, and the better utilization of the product. Burbank's marvelous work in new flowers and fruits, trees and plants of all kinds, has at last received the popular recognition it has long deserved. The possibilities in this direction now appear almost limitless.

The staple crops of the country, such as wheat and maize, or Indian corn, have been the subjects of much investigation, covering every phase of their improvement by selection, breeding, tillage, fertilization, harvesting, curing, preparation, and utilization. The results have been of vast practical value. Those in the cases of wheat and corn will illustrate the progress made.

Not only has it been shown that the quality of wheat for special purposes can be materially changed at will to suit necessary conditions or special wants, but the productivity of races or types of the grain can be fixed by systematic seed-selection. For plants can be bred just like animals. Burbank's wonderful work is so well known now that we need not describe it. At the Minnesota Experiment Station new varieties of wheat have been produced by breed-

ing and selection, which, we are told, will increase the yield in the hard-wheat region of the Northwest by from three to five bushels per acre. Reduced to a practical basis, this means an increase in the wealth of the three states, Minnesota, and North and South Dakota, of from $20,000,000 to $40,000,000 annually. The yield and quality of wheats in that region has already shown a marked improvement as a result of the distribution of seed of two or three improved varieties. As varieties suitable for other sections will undoubtedly be originated in due time, the results that will accrue when these methods have been extended to all the wheat-producing areas of the United States can hardly be imagined. The wheat crop of this country for the year 1902 was 675,000,000 bushels, valued at $425,000,000. The average yield of wheat is only a little over thirteen bushels per acre, considerably smaller than that of England where it is twenty-six, and that of Germany where it is thirty-one. If, by the introduction of these improved varieties and of better methods of tillage, the average yield of this country can be increased no more than two bushels per acre, the total increase for the entire country will be 100,000,000 bushels per year, worth about $100,000,000. This would seem to be entirely practicable. If the excellent prospect of increasing the nitrogen-supply in the soil for cereals does not allay all anxiety regarding starvation, the results in breeding new varieties of wheat and other food-plants should certainly put that fear to sleep for a long time to come.

No less interesting and instructive is the recent work in corn-breeding conducted at the Illinois and Kansas stations. Although corn, which is this year yielding probably two and three-fourths billions of bushels, worth approximately one and a half billions of dollars, heads the list of cereals in value, until the valuable work of these experiment sta-

tions was announced there had been no material improvement in the production of this crop in twenty years. The Illinois station has shown that if the methods of selection practiced by it, which are quite feasible and within the reach of every farmer, were followed throughout that single state, the increase in production in one year would amount approximately to $20,000,000.

Methods have also been found for changing the composition of the grain itself to meet special requirements: such as an increased yield of oil or of protein. Since the manufacture of oil from corn has become an industry, the amount of this constituent is a matter of considerable consequence. By selection the oil-content has been doubled in some varieties.

The most important question, however, connected with the improvement of corn is that which relates to its value as a well-balanced food. Its relative deficiency in protein has probably been the chief reason this grain has not been more extensively used as a human food in continental countries. It has, therefore, long been a question how to increase the protein in a grain of corn at the expense of the starch and fats. As the nitrogen, like the other constituents in the grain, varies in the different varieties, the way is thus opened for the control of the variations in this important element. The Illinois and Kansas stations have been engaged for some time upon this problem. By the selection of varieties containing a high percentage of protein, it has been found possible to develop strains containing an increased amount of this desirable substance. The protein-content of some varieties of corn, now apparently well fixed, has been increased fully 2.5 per cent, that is, from about 10 to about 12.50 per cent, which makes corn equal to the average wheat in this respect. In special cases it has been increased to even as much as 17 per cent.

Should wheat then fail us, Indian corn will be ready to take its place with an equal amount of protein.

The development of the rice industry in Louisiana and Texas furnishes a good example of the building-up of a new industry by the introduction of a new type of seed and of improved methods of cultivation and harvesting. Rice was one of the earliest introductions into this country and was grown for nearly two hundred years in South Carolina and the adjacent states with little improvement of method. It was thought that these states were the only ones that possessed the requisite irrigable lands. It has recently been discovered, however, that the prairie lands of southern Louisiana and Texas will produce large crops of rice, if provided with the requisite water, which is now obtained from bayous or artesian wells. The water is drained off in time to permit the ground to dry and the crop is then harvested with machinery similar to that used with wheat. As a result of these improved methods, the total rice-production of this country has increased in five years from about 100,000,000 pounds to about 400,000,000 pounds. The two states mentioned produce over 90 per cent of this. As the American people import some 40,000,000 pounds of rice annually, there is still room for the development of this industry. It is estimated that there are available in these two states alone 3,000,000 acres of land suitable for rice-growing. This is perhaps the best single illustration of the introduction of new races of seed and the use of improved methods of cultivation in their production.

I wish next to suggest another place where scientific investigations of a similar character are greatly needed. Cotton-culture needs precisely the same sort of attention from scientific men and expert agriculturists as has been given to wheat, corn, and rice. Considering the immense im-

portance of this crop, it is remarkable that it has not received more systematic study.

A group of states in the southern portion of America, constituting less than one-fourth of the total area of the United States, grows from 60 to 70 per cent of the cotton consumed in the world. The total value of the annual crop is exceeded, among the cultivated crops of the United States, only by Indian corn and occasionally by wheat, both of which are grown in almost every state. Since it is fair to assume that all the fibers have been pretty well tested as to their capabilities and uses, we may conclude that cotton, now the preferred fiber, is destined to grow steadily in favor with civilized man, and will continue to be used by him in increasing amounts. We are constantly finding new uses for it, and may safely predict that the demand for cotton will increase rather than diminish. It has been estimated that to meet the world's demand, when its standard of consumption has been raised to that of the civilized nations, will require an annual crop of at least 45,000,000 bales. It is therefore eminently desirable that the Southern States of America should meet this demand. Will they do it?

Present tendencies in the cotton world, at least, seem to answer "No." During the last four years the consumption of cotton seems to be rapidly overtaking the production, with the consequence that many of the mills in the United States, in England, and on the Continent have been running on short time. There are two principal causes which have contributed to this shortage. The most important has been the large increase, amounting now to at least 500,000 bales per annum, in the world's consumption. Of this increase, the greater part was in the Southern States themselves, where the consumption of cotton was doubled within the last ten years. These states are now taking nearly

twenty per cent of the cotton produced by them. The second cause of the shortage is the failure of the American cotton-planter to respond to the increased demand, and perhaps a slight falling-off in the yield per acre. In fact there are some reasons to believe that the yield per acre has been slowly but steadily declining for a number of years.

Although in many sections from 500 to 800 pounds of cotton may be obtained by good cultivation, the average yield of cotton in the United States is only about 190 pounds of lint per acre. There is evidently great room for improvement in the methods of cultivation and fertilization, and especially for improvement of the plant itself. Any one who has traveled through the South will acknowledge that the methods of cotton-culture are the poorest and most backward used with any staple crop in our country.

Cotton is limited by climatic conditions to that portion of America south of latitude 37. The essential features of the climate in this section are a long, warm season and a peculiar distribution of the rainfall. Statistics show that the fluctuations in the yield per acre in a given section are less in the case of cotton than in that of almost any other product of the soil. The production of cotton may be due to the greater uniformity of all the climatic conditions obtaining in the cotton-belt, but the chief determining condition as between different sections of our country is the amount of light and heat distributed over the required number of days. For cotton is a sun plant. As a rule a certain amount of sunshine produces, upon a given territory, a certain amount of cotton. The distribution of rainfall is also important, but sunlight is the chief factor. The plant requires an abundant supply of moisture during the growing stage, but can stand a good deal of drought after the middle of summer is passed. Now the section of the country providing these conditions measures only about

500,000 square miles, less than one third of the total settled area of the United States. Some 50 per cent of this area is contained in farms, and about 21 per cent is improved; but only about five per cent of the total area, or one tenth of the area in farms and one fourth of the area of the improved lands, is annually cultivated in cotton. If the whole area in farms in this section were cultivated in cotton, it would produce at least 80,000,000 bales. So far, therefore, as soil and climatic conditions are concerned, the Southern States can produce seven or eight times as much cotton as they now do.

But soil and climate are not the only conditions. It requires men and mules to make a cotton crop. It is generally recognized that the labor used in the production of cotton is something over fifty per cent of the total expense of growing the crop. This exceeds the cost of labor in growing corn and wheat, and also in many manufacturing industries. But statistics of population show that there is labor enough available in the South to handle an increase in the cotton crop such as the cotton-belt is capable of producing under favorable conditions. The Negro is well adapted for working in the cotton-fields, and his children are the only successful cotton-pickers known. The great need is that this labor be better trained and organized. Although the supply of mules and horses is inadequate at present for the production of a crop of this size, they might be raised within a few years.

We come thus to the question why the South does not actually produce more cotton to supply the world's increasing demand. It is commonly stated that the low prices which prevailed for a number of years led the planters to diversify their farming and to devote more of their means and energy to the production of general farm-supplies. This is true; but when this has been successfully

accomplished, the planters should be in an even better position to produce the crop demanded. Where then is the trouble? Experts seem to agree that the chief difficulties are the impoverishment of the cotton-soils through continued cropping under the renting system, and the running-out of the seed. Observation in the cotton-belt leads us to believe that fully two-thirds of the planters use seed taken entirely at random from the public gins, about which they know nothing whatever.

It is safe to estimate that the cotton crop could be doubled on the same acreage by the use of good seed and careful methods of tillage and fertilization. Questions of tillage and fertilization must be left to the farmers chiefly, but the experiment stations should take up the question of improving the seed.

Certain definite things should be kept in mind in the process of cotton-seed development. Among these are an increased yield of fiber and of seed, an increased length of fiber with uniformity, the strength of the fiber, the season of maturity, adaptation to soil and climate, and resistance to disease. It is probable that cotton having these different qualities will have to be bred to suit the soil and climatic conditions of each section. Here then is a great task, one, however, which offers magnificent rewards. It is firmly believed that the scientist and the cotton-planter will together be fully equal to its solution.

We have sought by these few illustrations to show what science has already contributed to the advancement of agriculture and how it may be expected to do still more for it in the future. No one now doubts that the progress of agriculture in the future depends chiefly upon the discoveries in science and their application to the practical problems of the farmer.

The discoveries of science, however, and the demonstra-

tions of the United States Department of Agriculture through its experiment stations, will be of little value to the American farmer unless he is well enough educated to understand them and skilled enough to apply them. More secondary agricultural schools and schools for the training of horticulturists, dairymen, and other specialists are needed in all our states. The higher agricultural institutions and departments of agriculture in our universities are answering an admirable purpose in training experts and investigators; but so far we have very few secondary agricultural schools. It is believed that the next development will be along this line. Certainly the greatest need of American agriculture is farmers trained to habits of observation and skilled in the application of science to their business. What the new agriculture will do for the advancement of the race when even a majority of farmers have learned its methods confounds the imagination. This greatest of productive industries will lay a new foundation, deep and broad, upon which man will build a new life, growing ever nobler and truer "unto the perfect day."

SOME PRESENT PROBLEMS IN AGRICULTURE

BY LIBERTY HYDE BAILEY

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AGRICULTURE is now in a transitional stage. It is passing from the old to the new. It is pupating. The problems are great, and they all have a forward look.

Most of these problems are incapable of solution quickly. They must ripen and mature. They are many; this paper proposes only to state a few of them that appeal most to me, leaving the discussion of them to others.

The problems of agriculture are of pressing importance, both to agriculture itself and to the public welfare. They are of two kinds: (1) the technical problems of the business, (2) the problems of adjustment to the affairs of our growing civilization.

The problems of adjustment are of the greatest public concern because agriculture is our greatest occupation and is necessary to civilization. Of all occupations, it employs most men, most capital, and is followed in the most places. It probably must always employ from one fifth to one fourth of the people of any self-sustaining nation. There are supernumerary, eleemosynary, and parasitic occupations; but agriculture is basic.

Other occupations have had their day in the public appreciation. All of them have been born out of agriculture. Tubal-Cain was the descendant of Adam. The greatest of public problems are to come with the rise of the agricultural peoples. Just because it is basic, agriculture has been conservative and patient. Fundamental strata are likely to be azoic; but in great world-movements they are also likely to rise permanently to the top.

The farmer is a wealth-producer. Therefore his importance in the body politic is primary. He deals with elemental forces. As a wealth-producer, he will come to have a larger voice in the expenditure and waste of wealth in maintaining armaments of war. All his instincts are of peace.

The public problems of agriculture have been slow to gain recognition. The agricultural questions that we customarily discuss are those of the individual farmer. The burden of our teaching has been that the farmer must be a better farmer. Only in recent years has it come to be fully recognized that agricultural problems are of the greatest national and governmental significance. Consider how recent is the Land Grant Act, the secretaryship of agriculture in the President's cabinet, the Experiment Station Act, the origin of a definite farmers' institute movement, the development at public expense of fertilizer and feed controls and other policing policies, the making of liberal grants of public money for specific agricultural uses.

Governmental fiscal policies have been shaped primarily for other occupations, as, for example, the tariff for protection. This is primarily a manufacturer's policy. It matured with the rise of concentrated manufacturing. One of the stock arguments of the protectionist when addressing farmers is that any policy that aids manufacturing interests must indirectly aid them. I am not here to dis-

cuss or to criticise tariff legislation, but it is apparent that such legislation is only secondarily of benefit to agriculture. It has been the history of institutions that special and organized interests receive attention before care is given to the common people and the masses.

We have really not endeavored, as a people, to solve our technical agricultural problems until within the present generation. We have escaped the problems by moving on to the west. Thereby we have fallen into the habit of treating symptoms rather than causes, as the policeman does when he orders an offender to "move on," and leaves the real difficulty for some one else to solve. Even yet, farmers are moving on to find land that is not depleted and regions free of blights and of pests. The real development of agriculture lies in developing the old areas, not in discovering new ones. When virgin land can no longer be had, scientific agriculture will come. An isolated island develops something like a perfected agriculture, as one may see in Bermuda or Jersey. The earth is an island: in time it will be developed.

As agriculture comprises a multitude of different businesses, everywhere touching many sciences and having contact with many public questions, so it is impossible for one person adequately to state even its present and pressing questions. I have been in the habit of inquiring of farmers, students, and colleagues what they consider the agricultural problems to be. Many of the problems that they have stated to me are temporary, local, or incidental. Others are common to many occupations, having to do with the general constitution of society and the general trend of economic events. In this paper I have tried to assemble statements of such questions as appear to me best to illustrate the complex nature of the subject before us. I wish I could give credit to the sources of all the suggestions,

but this is impracticable, even though in some cases I have followed very closely the ideas and the language of my informants. I shall be obliged to assume full responsibility for the statements.[1]

The Technical Agricultural Problems

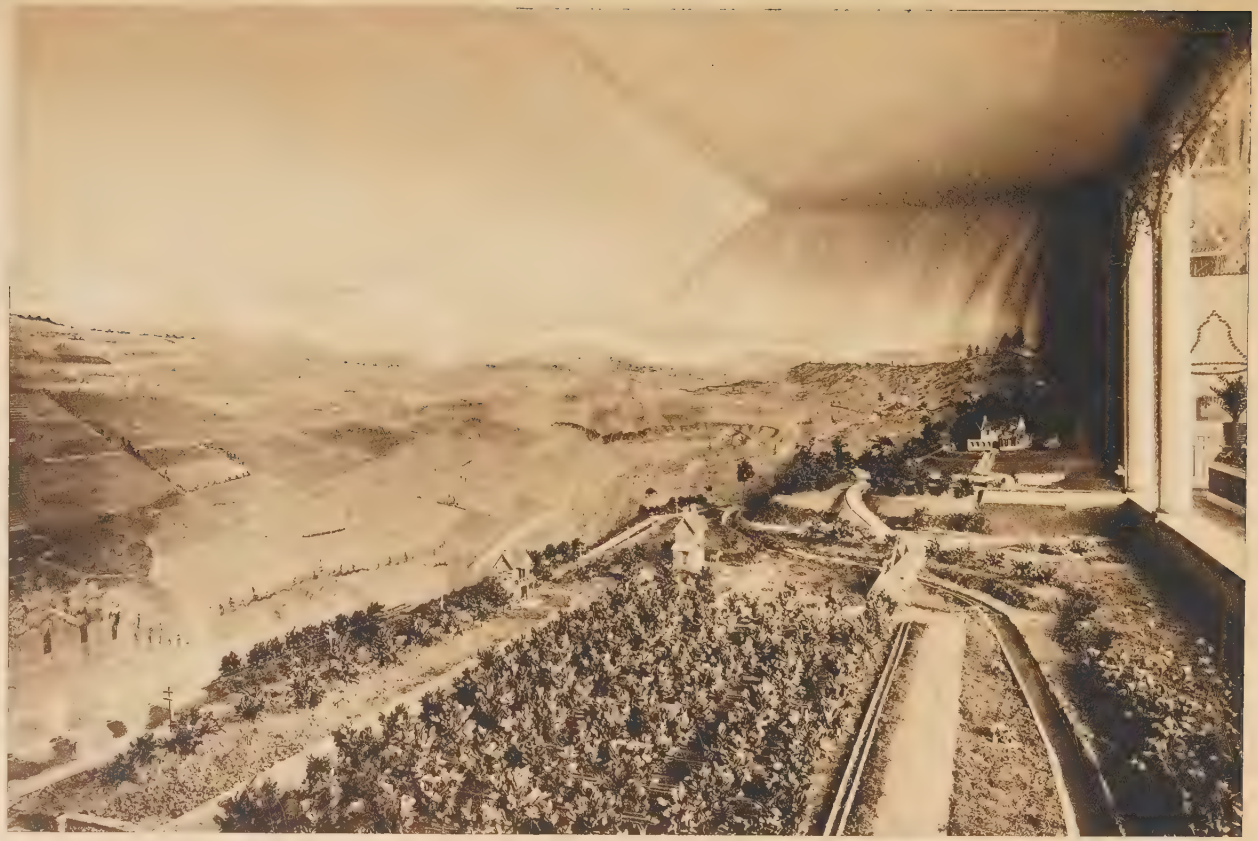
In America the so-called problems of agriculture have been largely those of the mere conquest of land. They are the result of migration and of the phenomenal development of sister industries. They have resulted from a growing, developing country. They have been largely physical, mechanical, transportational, extraneous—the problems of the engineer and inventor rather than of the farmer. The problem has not been to make two blades of grass grow where only one grew before, but how economically to harvest and transport the one blade that has grown almost without effort.

During the past hundred years there has been an area of development on the western border of the country, and this border has been able to compete at an economical advantage with the older area farther east. The price of land has fallen in the East, while it has risen in the West. From 1870 to 1900 we practically doubled our population and doubled our agricultural area. Aside from the geometrical increase in the population, this development has been due largely to a fertile, level, practically treeless prairie. Hitherto the axeman had hewn his way tree by tree. The development of the area west of the Mississippi River is probably the most remarkable in the history of the world. A second cause for this development is the consolidation of railroads into transcontinental lines; and another is the improvement of labor-saving machinery, of which the self-

[1] I am under special obligations to my colleagues, Professors Hunt and Lanman, and to one of my students, Mr. Charles Aronovici.

IRRIGATION LANDSCAPE IN CALIFORNIA.

California has proved what can be done in that State to render arid lands productive by the use of this system. The accompanying picture is that of a model presenting a beautiful and comprehensive view, admirable in its perspective, and exhibiting a scene perfectly simulating nature, including canals, orchards, villas, and an expanse of valley, with mountains forming the background.



binding harvester is the most conspicuous example, a machine that first attracted wide attention at the Centennial Exposition in 1876.

To this day the American is a cheap-land farmer. A few minutes on the train from a European city brings one into a highly tilled agricultural country. The other day I took an express train from New York City. It was three-quarters of an hour before I saw what I could call a farm, and a full hour before I reached a farming country.

As early as one hundred years ago, a distinct movement for the betterment of agriculture had set in. This movement was largely educational. It was an effort to improve the farmer quite as much as to improve the farm. Washington was vitally interested in the problem. He wished to have a central board or clearing-house for agricultural information. The full fruition of his hopes came with the establishment of a secretaryship of agriculture in the President's cabinet, in Benjamin Harrison's administration. In 1799 a concrete proposition for the establishment of an agricultural college in Pennsylvania came to an untimely end. In 1821 instruction was given in agriculture in the lyceum at Gardiner, Maine. In 1824 a school of agriculture was opened at Derby, Connecticut. A number of other similar attempts were made previous to the passage of the Land Grant Act of 1862, but of these only two or three persist. The gist of the whole movement was to adapt education to men's lives. The culmination was the Land Grant Act, the purpose of which is "to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." So far as agriculture was concerned, the Land Grant Act was somewhat premature. The developing and organizing mechanical and engineering trades were the first to profit by it. Agriculture will now have its turn.

The tide to the limitless west rose and fell, and we came to a pause. The technical problems of the farmer called for study. His personal difficulties pressed for solution directly on the farm. These problems are of two categories: (1) to remove the special disabilities (insects, fungi, weeds, animal diseases), (2) to augment production (fertilizers, soil studies, tillage, improving plants and animals). Then was born the experiment station (in 1887): the idea to improve the farm; it is investigational, not educational

How special the purpose of the Experiment Station Act is may be seen at once from the purposes that it definitely mentions:

"That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage-plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective states or territories."

The experiment stations are holding to these special

fields with great faithfulness. In a lot of three hundred and fourteen bulletins that came to my attention bearing the date of 1903, the following rough classification of subjects was made:

Bulletin, 1903

Insects, diseases of plants	63 or 20%
Feeding and grazing	52
Fertilizers	37
Farm crops	33
Fruits, orchards	28
Dairy (milk and cheese)	23
Diseases of animals	16
Meteorology	15
Garden vegetables	12
Sugar	7
Natural resources, irrigation	7
Poultry	4
Weeds	4
Ornamental plants	4
Seed germination	3
Educational	3
Forestry	2
General advice, bees, exhibitions, plant-breeding, etc	1
	314

Some epochs are now passing—as the fertilizer epoch based on agricultural chemistry. The larger question of self-sustaining farm management is now pressing. Three categories of technical farm subjects are just now beginning to demand much thought: (1) problems of feeding to increase efficiency of farm animals; (2) problems of breeding of animals and plants for the same purpose; (3)

problems of the business organization of the farm, or development of a farm-plan. We are beginning to apply research to large fundamental questions. The earlier subjects of investigation in the agricultural experiment stations were mostly the smaller and incidental ones. A good many of them were vest-pocket questions. Now the fundamental or backbone crops and products are being investigated in their entirety—the corn crop, the cotton crop, the grass crop, the milk product, the beef product. The experiment stations are originating a kind of constructive investigational method, and the really great questions are ahead of us. Larger problems come last.

We are now just coming to the large question of adaptation of special areas to special purposes. In the future one of the problems will be the more perfect adaptation of the kind of farming to soil and climate. As an illustration, the production of domestic animals for meat and for wool has been most extensive on the western border of the developing country for economic reasons, and not because the area is naturally best adapted to this enterprise. The central Mississippi Valley is primarily adapted to the production of cereals and not so well adapted as the North Atlantic States to the production of grass either as pasture or hay. These Atlantic States are particularly adapted to growing all kinds of trees and of grass. In the course of time, therefore, we may expect that the production of live-stock will become more important in the East. Out of this grow some immediate problems. At present, live-stock husbandry in the East can be carried on economically only when large tracts of land can be purchased at low price. It is possible to purchase small tracts of land at comparatively low price, but not possible to purchase large areas. More of the live-stock will be raised on small farms within the more densely populated districts, with comparatively

few animals to a place. This will lead to the question of maintaining the improvement in domestic animals. It will mean the gradual substitution of soiling systems for pasturing systems, and this will lead to remoter economic and social changes.

New industries are to be developed. This calls for special governmental recognition. The national Department of Agriculture aids such new enterprises by giving counsel and investigating the special technical difficulties; but is this kind of aid sufficient? If the government helps new manufacturing industries by giving them special privileges, why not aid new agricultural industries by bounties? If a bounty system were to become a recognized public policy (following perhaps the experience with sugar bounties), would it result in undesirable social and economic changes? The money grants to agriculture are only a fair offset to special privileges given to other industries.

The Social and Economic Problems

We are now returning to the farmer, although still holding to the farm. There is a distinct recrudescence of the educational point of view. The new emphasis is to be placed on the man rather than on his crops. The farmer is a citizen as well as a farmer; he is an important factor in public affairs.

The new education must reach the farmer in terms of the whole man—his particular business, his home and its ideals, his relation to good roads, good schools, the church, to social forces, to all that makes up a broad and satisfying country life. We must give attention to the ideals of living as well as to the ideals of farming. The sanitation of the farm-home, the architecture of the buildings (what silent and effective teachers buildings are!), the reading, the character of the farmyard, the questions associated with

the bringing-up of children, the social and commercial organizations—these are the kinds of subjects that the rising educational impulse must attack.

All this enforces the economic and social questions relating to agriculture. The greatest problems of American agriculture are not the narrower technical ones, but the relations of the industry to economic and social life in general. Agriculture has not as yet been able to call to its aid in any marked degree those forces and tendencies which have culminated and been of such economic value in the general business world, in the great productive and distributive aggregations. The complete solution of the economic ills of American agriculture may not be in coöperation, and yet in both the productive and distributive phases this is perhaps the most apparent remedy. Coöperation in distribution has made a beginning, but coöperation in production is still almost unknown. Are Kropotkin's ideals attainable?

The problem of the supply of capital in agriculture has never been solved in this country other than in the most expensive way. Capital must return to the land. Two factors enter into the problem: (1) to demonstrate that capital can be made remunerative in farmed land, (2) to insure that land will not bear an unjust burden of taxation.

Closely associated with the economic side is the sociological phase. In the days when all were interested in agriculture, both school and church flourished, but in these later days both have lost their molding influence in the country, though the former shows signs of renewed activity vital to the community.

The specific economic and social questions that even now press for study are so numerous that they cannot be catalogued in an address of this character. Is there still an active exodus from the country? If so, is the movement

caused by purely economic conditions, or is it in part the social attractiveness of the city? In other words, does the education of the farmer fit him for the appreciation of the esthetical and philosophical values of his environment? In what relations do the labor-saving devices stand to the rural exodus? Can it in any way be due to super-population of the rural communities? Are the final rewards of labor greater in the city than in the country? Is the arrested development of country church and school in any way responsible?

What are the tendencies as to size of farms? Is the American starting with small individual ownership, tending towards consolidation into larger units? Is the European, starting with large landlorded ownership, tending towards small individual units? Are the small farms decreasing in number? In what way does the development of the railroads and electric roads affect the size of farm properties? In what way do the labor-saving devices influence the size of farms? Could coöperation of farmers remedy any tendency towards large farms? Or, are larger farm units to be desired?

What can coöperation do for the farmer? Must it be economic, social, political, or to increase production? What are the moral and psychological effects of coöperation? What relation can coöperation have to the isolation of the farmer? To his hygienic conditions? Is it possible or desirable by means of coöperation to save small individual ownership of farms?

Is it true that the country promotes health better than the city? What are the diseases of the country? Are there mental diseases of isolation? Are most of the farmer's diseases due to his work, environment, or poor intellectual preparation to meet the requirements of his condition? What could the state do for the farmer from a

hygienic standpoint? What are the relations of farm water-supplies to the prevalence of typhoid fever and other diseases?

How is isolation to be overcome? By a hamlet system? Or by a distributive system of communication—as by better roads, trolley-lines, auto-vehicles, rural mail delivery, telephones, traveling libraries, coöperative reading-courses? Is the social life of the small village as vital and wholesome as that of the separated farm-home?

These are only the merest suggestions of a very few apparent present problems. They are not to be solved by any *a priori* reasoning, nor by using the stock statistics and opinions of economists and sociologists. The field must be newly studied. New data must be collected. New means of attack must be developed. With much painstaking, actual facts in detail must be secured. What is the actual social and economic status of every farmer in a township? a county? a state? Who knows? History must be studied from a new point of view. The very foundation of historical development is public opinion of the common people; and until within the past century the common man was the farmer. Agriculture is the basis of history. The best data of the actual conditions of the people antecedent to the French Revolution are said to be found in Arthur Young's minute description of the agriculture of France. The historian of agriculture is yet to be born.

As an example of the inadequacy of our information on important economic problems, let me cite the most pressing problem just now confronting the American farmer—the question of farm-labor. Farm-labor is scarce; it is dear; it is inefficient; it is unreliable. Yet we read of the armies of the unemployed asking for bread. Why? Who can answer? Who has the data? There seems to be not one authority to whom we can turn. It is apparent that these

serious pressing problems—scarcity, expensiveness, inefficiency of farm-labor—are only symptoms of some deep-seated maladjustment.

A large proportion of the labor on farms is done by the farmer himself or his growing family. The inability to find steady employment for laborers is a very difficult problem. Ordinarily, men desire to work all the time and to use their energy to the best advantage. A farmer's family arrives at the productive age when the parent is between forty-five and sixty. The farm does not offer opportunity for the sons because the father still desires to maintain his activity. The farmer does not take the boy into his business to the same extent that other business-men do. The result is that the sons must find employment elsewhere, and in the nature of the case they most conveniently find employment on salary. By the time the father is sixty-five to seventy years of age and feels the necessity of giving up the farm, the sons are engaged in other lines of effort which it is not practicable for them to leave. The result is that the farm declines with the declining years of the father and on his death is sold or becomes a rented farm. Occasionally a parent solves the difficulty and herein a distinct public responsibility rests on the individual farmer.

Is the farm-labor difficulty a too low wage-rate? Is farm-labor inefficient merely because it is cheap? If so, how must the farm be made to be able to pay a rate in competition with other labor? Has the tariff contributed to the inequality? Is social poverty of the country districts a cause? Is the lack of continuity or unsteadiness of farm-labor responsible? Has the decrease in the size of the farmer's family been responsible for part of the trouble? And if so, why has his family decreased? Must the farmer of the future raise his own labor? Must machinery still further come to his aid? If so, what effect will this have

on systems of agriculture? Will the urbanization of the country tend to establish a regularity of farm-labor? Will cheap railway rates from cities for laborers aid in maintaining the supply of labor for those living on the land, making it possible for the laborers to find work during winter in some neighboring community (it is said to have helped in some parts of Europe)? Can we develop a competent share-working system, in which the owner of the land still retains directive control? And if so, will social stratification result? Must there come a profit-sharing system? Or must the greater number of farmers themselves become employees of men of great executive ability who will amalgamate and syndicate agricultural industries as they have consolidated other industries? Is the agriculture of the future to be a business of fewer and larger economic units? If so, how will this affect the centres of population and the social fabric? Will the lack of farm-labor force us more and more into "nature farming"—the hay and pasturage systems? What, in short, is the farm-labor problem?

The country as well as the city must be made attractive and habitable. It must express and satisfy the highest human ideals, else it will not attract the best men and women. In area and population, the country is the larger part of the national domain: the improving of the ideals of the persons that live therein is one of our greatest public questions. The farmer is the conservative, not the dynamic element of society. We live in a dynamic social age.

The farmer always will be relatively conservative. His business is rooted in the earth. In a thoroughly well-developed agriculture, the farmer does not move his business rapidly from place to place. He remains while others move on. Therefore is it especially necessary that we ex-

tend to him all the essential benefits of our civilization. (I hope he will not care for the unessential benefits.) He has the rural free delivery of mails—although this was thought to be impossible a few years ago. Shall he not have a parcels post? Each year the good roads movement, originating in the cities, is extending itself farther into the real country. Trolley-lines are extending countryward; soon they will come actually to serve the farmer's needs. The telephone, as a separate rural enterprise, is extending itself. Extensional educational enterprises are reaching farther and farther into the open farming districts. Coöperation and organization movements are at the same time extending and concreting themselves.

Farming stands for individualism as distinguished from collectivism. Farming enterprises will be more and more consolidated and capitalized, but they can never be syndicated and monopolized to the same extent as many other enterprises. How best to preserve and direct this democratic individualism of the open country is one of the greatest questions now confronting us.

The art impulse will soon take hold of the country, as it has already laid hold on the city. We have lived all these centuries on the assumption that work of art is associated with buildings and "collections." As nature is the source of all our art, so the time is coming when we shall allow nature herself to express her full beauty and power. We shall go to nature oftener than to art galleries. We shall first remove objectionable features from the landscape—features for which man is responsible—such as all untidiness and blemishes, all advertising signs, all unharmonious buildings. Then we shall begin to work out our enlarging aspirations with the natural material before us—make pictures with sward and trees and streams and hills, write our ideals in the sweep of the landscape and the color of the

flowers. Our "art" societies still confine themselves to imitation art. The great art societies will be those that give first attention to nature as it is, and to human ideals expressed in nature, not only as it is represented to be in plastic materials and in paints.

Of all the forces that shall revitalize and recrystallize the country, the school is the chief. The schools make the opinions of the nation. The city school has been developed, but the country school has been relatively stationary; yet every farm family is interested in the school. The farmer believes in schooling, just as completely as the city man does; but he may not be convinced that the schools are really touching the problems of life. Persons make more sacrifices for their children than for any other cause. Probably more persons leave the farm to educate their children than for any other cause.

An ideal condition would be the total abolition of rural schools as such. The custom of setting apart towns and villages into special school-districts in order separately to tax the town or village for school purposes has been a misfortune to the rural schools. The whole school-system of any state should be organized on a broad enough basis so that every boy and girl, whatever the occupation of the parents, shall have the opportunity of securing the same, or at least equally efficient, education. The country mill has gone. The old-time country school is a passing institution. A one-teacher school may be as inefficient as a one-man mill. Schools will be consolidated into larger or at least into stronger units. The first pedagogical result will be the differentiation of the work of teachers—perhaps one of these teachers can give special attention to nature-study and country-life subjects.

The school must connect with real life. It will be one of the strong constructive and dynamic influences in our

social organization. At present its influence is receptive and passive, rather than creative. The particular subjects that shall be taught are of less importance than the point of view. Many questions of detail are to be discussed, often with much travail; but the final solution must be to allow every subject in which men engage to find its proper pedagogic place in a wider and freer educational system than the world has yet seen, and to place agricultural subjects with the others and not exclusively in institutions by themselves.

Whatever our doubts and misgivings, the American farmer is bound to be educated. He will demand it. Having education and being endowed with a free chance, he will not be a peasant. Some persons have made the serious mistake of confounding peasantry with comparative poverty. Peasanthood is a social stratum. It is a surviving product of social conditions.

If the open country is to be made attractive to the best minds, it must have an attractive literature. There must be a technical literature of the farm, and also a general artistic literature portraying the life and the ideals of the persons in the country. The farm literature of a generation ago was largely wooden and spiritless, or else untrue to actual rural conditions. The new literature is vivid and alive. The new, however, is yet mostly special and technical, with the exception of the growing nature-literature. Artistic literature of the farm and rural affairs is yet scarcely known. Where is the high-class fiction that portrays the farmer as he is, without caricaturing him? Where is the collection of really good farm poems? Who has developed the story interest in the farm? Who has adequately pictured rural institutions? Who has carefully studied the history of the special farm literature that we already have? Who has written the biological evolution

progress that attaches to every domestic animal and every cultivated plant? We need short and sharp pictures of the man at his work and the woman in her home—such quick and vivid pictures in words as an artist would stroke on his canvas. There is nobility, genuineness, and majesty in a man at useful work—much more than there is in a prince, or a general, or a society leader, whose rôle it is to pose for the multitude. The man holding the plow, digding a ditch, picking fruit, the woman sweeping or making bread—what stronger pictures of human interest can there be than these? If I could have the choice of the mite that I should contribute to the developing and the nationalizing of agricultural sentiment, I should choose its literature.

WORKS OF REFERENCE FOR THE DEPARTMENT OF TECHNOLOGY

(Prepared through the courtesy of Chancellor W. S. Chaplin, Washington University.)

CIVIL ENGINEERING

ALLEN, Railroad Curves and Earthwork.
BAKER, Roads and Pavements.
Masonry Construction.
BAUMEISTER, Sewerage of Cities.
BOVEY, Hydraulics.
BURR, Materials in Engineering.
CHURCH, Mechanics of Engineering.
COMSTOCK, Field Astronomy.
DOOLITTLE, Practical Astronomy.
FOSTER, Electrical Engineer's Pocket Book.
FREITAG, Architectural Engineering.
Fireproofing of Steel Buildings.
FRIZZELL, Water Power.
FOLWELL, Water Supply.
Sewerage.
GERHARD, Sanitary Engineering.
HARCOURT, Harbors, Rivers and Canals.
HAYFORD, Geodetic Astronomy.
HAZEN, Filtration of Public Water Supplies.
JOHNSON, Surveying.
Framed Structures.
Engineering Contracts and Specifications.
KENT, Mechanical Engineer's Pocket Book.
LANZA, Applied Mechanics and Strength of Materials.
MARSH, Reinforced Concrete.
MEAD, Irrigation Institutions.
MERRIMAN, Hydraulics.
MERRIMAN and JACOBI, Roofs and Bridges.
PATTON, Foundations.
RANKINE, Applied Mechanics.
RAYMOND, Plane Surveying.
SEARLES, Field Engineering.
SEDGEWICK, Sanitary Science.

THOMAS and WATTS,, Improvement of Rivers.
TILSON, Street Pavements.
TRAUTWINE, Civil Engineer's Pocket Book.
TURNEAURE and RUSSELL, Public Water Supplies.
WADDELL, De Pontibus.
WAIT, Law of Contracts.
Law of Operations.
WELLINGTON, Economic Theory of Railroad Location.
WHEELER, Sea Coast.
WILSON, Irrigation Engineering.

MECHANICAL ENGINEERING

Transactions of the American Society of Mechanical Engineers.
Proceedings of the Institute of Mechanical Engineers.

ELECTRICAL ENGINEERING

Transactions of the American Institute of Electrical Engineers.
Journal of the (British) Institution of Electrical Engineers.

WORKS OF REFERENCE RELATING TO THE SECTION OF AGRICULTURE

(Prepared through the courtesy of Professor Liberty H. Bailey, Cornell University.)

(The literature related to technical farm operations and to the scientific phases of agricultural production is now very voluminous. It is comprised in a considerable part of books and also in a great number of Experiment Station publications as well as in the current discussions in the agricultural press. In the field of rural economics and rural sociology there is yet very little specific literature. In this direction the following publications may be consulted for their bearing on the general subject.)

Adams, Edward F., The Business Farmer.

Bailey, L. H., The Outlook to Nature.

Crookes, Sir William, The Wheat Problem.

Dodge, J. R., Farm and Factory: Aids to Agriculture from Other Industries.

Elliott, J. R., American Farms.

Fairchild, Geo. T., Rural Wealth and Welfare.

György, Andrew, The State and Agriculture in Hungary.

Haggard, H. Rider, A Farmer's Year, and Rural England.

Hunt, Thos. F., How to Choose a Farm.

Kropotkin, P., Fields, Factories and Workshops.

Mead, Elwood, Irrigation Institutions.

Myrick, Herbert, How to Coöperate.

Pratt, E. A., The Organization of Agriculture.

Simons, A. M., The American Farmer.

Taylor, Henry C., Agricultural Economics.

Wallace, Henry, Letters to the Farm Boy.

Ireland, Industrial and Agricultural (Published by Dept. of Agriculture and Technical Education, Dublin).

Vols. x and xi of the Report of the Industrial Commission, Washington, 1901.

Vols. v and vi of the 12th United States Census.

Division of Statistics, U. S. Department of Agriculture.

ECONOMIC SCIENCE IN THE NINETEENTH CENTURY

BY ADOLPH CASPAR MILLER

[ADOLPH CASPER MILLER, Flood Professor of Political Economy and Commerce, University of California. b. January 7, 1866, San Francisco, California. A.B. University of California, 1887; M.A. Harvard University, 1888; Post-graduate, Harvard, 1888-90; Paris and Munich, 1895-96. Associate Professor of Political Economy and Finance, Cornell University, 1891-92; Professor of Finance, University of Chicago, 1892-1902. Member of American Economic Association. ADVISORY EDITOR OF *Journal of Political Economy*.]

THE part assigned to me in the programme of this Congress is an historical review of the science of economics in the nineteenth century; more particularly, as I conceive it, such a review as may serve to set forth the progress that has been made by the science in that time. To compress a century's history of any active science into a fifty-minute discourse is no easy task. But the task of the historian of economics is especially great, for economics has had its troubles in the nineteenth century. It has come by no short and easy path to its present position, whatever this position may be defined to be. And it has left the record of its troubles and wanderings in a literature of unusual extent and vast variety. Of activity at least there has been no end. Economics has made a history for itself if it has not made progress. So much, at least, is certain. But the history of a science must not be confused with its progress. Much that has a place in the history has little relation to progress. Since our interest lies with the progress of economics, it is my purpose to review the history only so far as it seems necessary for an appreciation of its progress. And all that is requisite for this purpose is to take a straight cut through the history, following the line that seems most

competent to exhibit those features of the past development that are significant for the understanding of the successive phases that make up the life-history of the science. But what shall be the line of view?

This question is the more difficult to answer because of the absence of a tolerable consensus of opinion among economists as to the proper character and constitution of the science. The *Methodenstreit* has not issued in a common understanding. I cannot agree with Professor Marshall that we have "worked our way through controversy to the extinction of controversy," if that is to be taken to mean a *rapprochement* on the fundamental question of the constitution of the science. If less is said about this question than formerly, it is rather because controversy has taught the futility of controversy and that economists have taken to doing things instead of talking about them. For one has only to compare the procedure of two such masterworks as Marshall's *Principles* and Schmoller's *Grundriss*, to appreciate how considerable the divergence of aims and methods still is. Economic science is still a thing of schools, each contemplating the results of its own work with much understanding and satisfaction, but taking little regard of the others. It was only the other day that a brilliant and dispassionate critic of the present position of economics lamented the persistence of what he called an "archaic habit of thought"[1] in the methods of the economists working under the guidance of the classical tradition. And but a short time before this, Professor Nicholson[2] had characterized the work of the historical school as "impres-

[1] Dr. Thorstein Veblen, in an article entitled *Why is Economics not an Evolutionary Science*, in the *Quarterly Journal of Economics*, vol. XII, p. 379. See also the remarkable series of articles on *The Preconceptions of Economic Science* by the same writer in the same journal, vols. XIII and XIV. Much help has been derived from these articles in the preparation of this address.

[2] In his presidential address on *The Reaction in Favor of Classical Political Economy*, given before the economic section of the British Association for the Advancement of Science, 1893.

sionism." This evidence and much more of similar effect might be quoted to show that economists are still far from being of one mind, and the reviewer who looks to find in the present state of economics a definite objective standard by which to estimate the work of the past, will find little guidance. We must, therefore, look elsewhere.

The place assigned to economics in the programme of the Congress might seem to suggest a way of handling the matter. Economics is grouped here with the "utilitarian sciences,"—with engineering, medicine, and agriculture. Though it is true that economics, like most of the sciences, began as a utilitarian science, its theoretical formulations being directed by a keen practical interest, and though it is true that the science derives its chief interest from the light it may throw upon the great questions of economic organization and control, and though it is also true that men of high repute claim that the science "is wholly practical" and "has no *raison d'être* except as directing conduct towards a given end,"[1] and though others, less frank in their avowal have yet cultivated the science with homiletical intent, yet I believe at this present day it would be a gratuitous innovation to undertake to estimate the progress of economics as a utilitarian science. The trend towards a scientific treatment of its subject-matter as distinct from its application has been one of the most marked symptoms of its growth. This is, in a sense, the progress of the science. Few economists would go the length that Cairnes did, a generation ago, but an increasing number would insist upon the observance of a sharp distinction between economics as science and political economy as art. Indeed, the vogue the term *economics* is coming to enjoy, as against the older term *political economy,* is due, in considerable measure, to the widespread desire in the science to

[1] Dr. William Cunningham in his *Politics and Economics,* 1885, p. 12.

have a name for the subject that shall be free from the misleading associations of the old name,—one that will more completely identify its character as a science after the usual meaning of the term. And, therefore, though the shadow of its early days still hangs over the science, it has happily moved too far away from that position to make an estimation of it as a utilitarian science advisable. Some other course must be chosen.

The course that I propose to take is to offer an outside view, to see how economics looks when viewed from the general standpoint of nineteenth century science. It ought not to be overlooked that a leading purpose of this Congress is to bring out the fundamental unity of all sciences,—their mutual relations and advance. The advance of knowledge in the nineteenth century has done much to dispel the notion that the several sciences are independent of one another. Those sciences that have lived unto themselves have lagged. The mutual advance of the progressive sciences has stimulated a belief that, in the midst of seeming diversity of character and interests, there is a fundamental unity of knowledge. Whether this belief will ultimately establish itself as a tested conclusion of experience, it needs no great insight to perceive that economics has a close relationship with other sciences. It must go outside its own boundary for much of its material, and it uses it with poor effect when not habituated to the methods and standpoints of those sciences from which it borrows. It is true that economics has not always acknowledged its dependent character and, in its desire to avoid entangling alliances, has sometimes incontinently isolated itself and led a barren life. Something of this sort is doubtless in the minds of those workers in other fields who tell us that economics is discredited by its old-fashioned habits of thought. Economists cannot afford to be indifferent to

criticisms of such import, especially when spoken with the sanction of authority. And this accounts for much of the perplexity in which economists find themselves when viewing the results of the work in their science in comparison with those of the material sciences.

Few things stand out more prominently in the history of nineteenth century thought than the change of attitude that the material sciences have experienced. It is sometimes said that modern science is realistic and sets a greater importance on facts as facts. But the older sciences were surely not indifferent to facts; for all science deals with facts. What distinguishes the later-day sciences is not the insistence on facts, but the dispassionate habit of presenting and construing them. For modern science, the matter-of-fact habit of mind is everywhere decisive. Instead of seeking to find the spiritual meaning which underlies appearances, modern science is content to present things as causually related in a material sequence. Helped on by the evolutionary concept of process and the notion of cumulative causation, a large part of the discipline of the material sciences has been devoted to purifying the scientific mind of the metaphysical animus. Genetic coherence is sought where formerly a spiritual tie was wanted.

How far our science has adopted the new conceptions is a matter of such vital interest as properly to suggest the course of the review to be undertaken. It must be admitted at the outset that it can give no more than a partial view. An alternative course has much in its favor. But with the echoes of controversy still sounding around us, touching the character, province, and method of economic science, it seems best to ask *how* the science has proceeded, rather than *what,* in point of doctrine, it has taught. Until a science attains a relatively high degree of maturity, a subordinate interest attaches to the development of its par-

ticular theories, for development of this sort may take place within, while the progress of the science as a whole is arrested. It is only those developments of theory that correspond to a change of front of the science that can be of consequence when we are trying to measure its advance. It seems best, therefore, in reviewing the science with this purpose, where brevity is necessary, to treat the viewpoint as the paramount concern, and to reach it by the shortest route. Progress in science means more than one thing, but it means no one thing more than the successive conquest of viewpoints that afford a fuller and finer knowledge of the conditions or processes with which the given science is occupied. Just as the history of a country may be read in its highways, and the progress of a people is written in their tools, so the history of a science is most clearly revealed in the paths it has followed and the methods it has used. In such a view of the matter, it is the lower levels rather than the upper levels of the structure of the science that are to be brought under notice. Economics has changed its theoretic constitution from time to time in the course of its modern history, and it will not be a misappropriation of time to inquire under the pressure of what exigencies or the stimulus of what impulses the modifications have taken place, and whether they have been in the direction of progress. It is the foundation, framework, and outfit of the science rather than its specific output that will need to be noticed, the bases of its theoretical formulations rather than the formulations themselves, —what is sometimes called the external history of a science in distinction from its internal history.

For the purpose of understanding the theoretical constitution that economics has had during the greater part of the nineteenth century, it is necessary to go back to some of its eighteenth century antecedents. To the Physiocrats

belongs the credit of having attempted the first great comprehensive synthesis in economics, and though the structure they erected was airy and fantastic, it served as a model for later generations beyond what has ordinarily been admitted. Many a later thinker is of closer kin to them than he would be willing to acknowledge.

Until the Physiocrats entered the field, economics was habitually treated as an art, the chief concern of which was to formulate maxims of public policy. With the Physiocrats the study takes a new direction, or what to all appearances is to be rated as a new direction. They set out to discover the natural laws of wealth, though to the Physiocrats natural law means something different from the empirical generalizations of later science. Theirs is a metaphysical conception of natural law and theirs is the metaphysics of the order-of-nature. Starting from this as their central position, they work outwards to the laws of society. The natural order of society is to them a simple deduction from the physical order of the universe, and the natural laws of society are simply the laws of the physical order applied to social relations. Therefore, the Physiocrats address themselves to a careful scrutiny of nature's processes and purposes. As they conceive the matter, it is the ceaseless exchange of matter and force between nature and man that makes up the natural life of society. That exchange is the phenomenon to be explained, and the order-of-nature explains it. The ultimate term of the Physiocratic formulation of economic truth is, therefore, the order of nature. The habitual effort to reduce all things to terms of nature is the characteristic and dominant feature of their thinking.

To the Physiocrat, the course of human events is under the guidance of nature. Nature is invested with a teleological propensity, working always for the physical welfare

of man. She can, however, be hindered or even thwarted, —not only can be, but has been. But as soon as men cease the infractions of her discipline, the natural course is resumed. In the end, nature always has her way, and her way is the best possible way, for she is the interpreter of the Supreme Legislator whose laws are intended to secure the welfare of man.

Such is the Physiocratic view of the order of nature. Starting with this conception, they set about to formulate the laws of wealth, the aim being to construe the economic process in terms of the natural order. And since the great enterprise in which nature is engaged is the support and perpetuation of human life, it follows that the supreme test of economic reality is the relation of any industrial function to this nutritive function of nature. Man's work is to be rated as efficient or otherwise according as it helps or hinders the consummations of nature's substantial end. Thus in the Physiocratic analysis the interest centers chiefly in production, and their economy is, therefore, mainly a theory of production. Specifically the test of productivity of any activity is its bearing upon the fund of human sustenance—food. Only such activities as enlarged the supply of the material basis of life are accounted productive—all else is beside the mark. Nature is not solicitous for the spiritual welfare of man; hence no alleged spiritual gains coming from diversion of industry from its true channel can compensate for the losses of nutritive material. From this principle follow by logical necessity the Physiocratic theory of the "produit net," the "impôt unique," their classification of industries and their predilection for agriculture. The system is one of singular symmetry and nice adjustment of parts.

Their theory of value presents itself as an integral part of this closely compacted system. If value be generically

conceived to mean that which avails towards some admittedly adequate end, then, for the Physiocrats, value must mean that which avails towards nature's work. Exchange values, those which result from the conventional rating of things in the market, manifestly could not satisfy the physiocrat's sense of reality. Natural values are the only real values, to be arrived at through an appraisement of things from the point of view of nature's purposes. Only that is accounted of value which contributes to the increase of nutritive material. Nothing could be farther from the Physiocrat's notion of wealth or economy than to make vendibility the attribute of wealth. That would have been a degradation of the science to the position of a mere "market philosophy."

Other features and details of the physiocratic theory lend themselves readily to a similar construction, but enough has been said to indicate how the metaphysics of natural propensity shaped the theory and to justify the view that economics made its *début* as a systematic science under the patronage of the eighteenth century metaphysics of nature. And it is a mistake to represent this expedient of thought as an invention of the Physiocrats. Their methods and procedure were such as commended themselves to the scientific judgment of the eighteenth century, for the order-of-nature conception played an important part in the philosophical speculations of its moralists and political writers. What was original and striking was the use the Physiocrats made of this conception in constructing a philosophy of wealth, and the new method by which they arrived at it, and the new authority with which they invested it. The postulates of their system were a curious blending of physics and metaphysics, but it is the metaphysics that is of chief significance for the subsequent history of the science.

It gives, however, a very faulty idea of the *significance*

of the physiocrats to represent them as mere system-builders. For them the distinction of a later day between art and science has no existence. Theirs is in truth a utilitarian science,—a sort of economic sociology in which of necessity the *is* and the *ought-to-be* are merged in one. They have no need of going outside the system to point applications of its principle. Under the *ordre naturel* whatever *is* of right *ought* also to be. The laws of the physiocratic economy are not statements of mere historical uniformities or sequences. The sequences are regarded of necessity as describing consummations to be desired, for they are, in a discreet sense, natural sequences. So, while thinking in the spirit of a utilitarian science, the Physiocrat is able to speak in the language of positive science. But, for all that, a positive science of economics, as concerned merely with the explanation of things, had not yet emerged. And what is true of the Physiocrats in this regard is true of much of the later sciences so far as it worked under the guidance of the metaphysics of natural propensity or any of its derivatives.

The next important advance in economics is connected with the activity of Adam Smith; and it is to be rated the most considerable advance ever accomplished for the science by any single individual. And his work is to be rated as a great achievement whether we regard the body of its specific teachings or whether we regard only its larger features as set forth in the general attitude of the author. The painstaking scholarship that has been brought to bear in recent years on the history of economic science has shown Adam Smith's indebtedness to his contemporaries to be greater than was once supposed. Very real affinities of thought and attitude are now traced where formerly the differences seemed prominent.

Particularly close is Smith's kinship with the Physio-

crats; so close that with the lapse of time there seems to be increasing disposition to group him with them, rather than to set either them or him apart from the direct line in tracing the pedigree of the science. Adam Smith stands on much the same plane of culture as the Physiocrats. With both, the fundamental constitution of the science is metaphysical, and with him, as with them, the metaphysics is the metaphysics of natural propensity; with this difference, that in Adam Smith the metaphysics is toned down somewhat and is made to play a less overt part in shaping the formulations of theory, which is, perhaps, only another way of saying, with just about the difference that we would expect between a representative French thinker of the eighteenth century and a representative Scotchman. Indeed, in this respect, Adam Smith may be said to occupy a transitional position in the history of economic thought, if the greater prevalence of the matter-of-fact habit of mind may be taken legitimately, as broadly describing the cultural advance of the nineteenth century. The sources that fed this advance in Adam Smith need not detain us. It is probably to be set down to the credit of no single influence or individual. He simply shared in the change of mind that was being operated for British eighteenth century thinking by the slow-working influences of the time, and that found their most definite philosophical expression in the skepticism of David Hume. So that an admirer of Hume might be pardoned for thinking that Hume did for political economy a service somewhat analogous to what he did for philosophy. However that may be, an appreciable change was coming over British thinking, characteristic out-croppings of which meet us on every page of Adam Smith. So far as he was hard-headed and factual he was a child of his time; but so far, again, was he also child of his time as he preserved, along with the new habit,

the metaphysical bias from which it was not given his century to shake itself free.

The feature of Adam Smith's thinking that is here under notice as marking an advance in the progress of the science may be viewed in another aspect. There has been not a little discussion as to the method of investigation followed by Adam Smith. Spokesmen for each of the rival methods—"induction" and "deduction"—have claimed Adam Smith on their side. But all that this means is that Adam Smith is in his ways of thinking at a transition. So far as the deductive method goes with the metaphysical way of handling things, the abundant use of it by Adam Smith shows the vitality of the metaphysical animus; and so far as the inductive method is a suitable companion of the more matter-of-fact habit. Adam Smith's frequent resort to it points to the presence of a new item in the conceptual equipment of the science. For this reason it is a matter of some difficulty to define Adam Smith's true attitude in a summary statement.

Adam Smith, like the Physiocrats, is concerned to find the *natural* laws of wealth, and his discussion runs almost habitually on the causal sequences of things; and, so far, justifies the title of his book, *An Inquiry into the Nature and Causes of the Wealth of Nations*. But a closer examination shows that, in his handling of the phenomena of wealth, he is not content to let the inquiry stop with the description of proximate causes. His feeling for reality is not appeased until the causal material situation is resolved or, at any rate, is resolvable, into its ultimate spiritual causes; in other words, for him things must have a meaning beyond what the naked situation yields. For him the causal sequence regularly implies a spiritual sequence, and sometimes a spiritual sequence is discernible where the causal sequence is broken. His plan, therefore, like the

Physiocrats', demands a scheme that shall be competent to exhibit the significance of the economic processes. But, while this much may be said with confidence, it is not so easy to say what that scheme is. It is not put forth with the Physiocrats' *naïve* frankness. Adam Smith is a Scotchman. Suffice it to say that to the older notion of a teleological trend in the course of events, Adam Smith adds the notion of a normal human nature. The human propensity to "truck, barter, and exchange" becomes the mechanism through which the "invisible hand" of nature accomplishes its purposes, and since men are pretty much alike, the mechanism is well-nigh faultless. It is, therefore, the workings of human nature as thus conceived rather than the operations of physical nature that form the object of Adam Smith's analysis. His system, like the Physiocrats', is mainly a theory of production, but man, not nature, is conceived to be the central agent in the process. His system has, therefore, been properly called the *industrial system,* for human industry, labor, is its efficient principle, the term in which economic knowledge is formulated. Though he looks in much the same direction, his outlook is broader than the Physiocrats'. Everything is viewed from the standpoint of production; all the economic processes are construed as aspects of the productive process, but the notion of production is widened so as to include every variety of industry, not alone that which helps the nutritive work of nature. So "natural" value belongs to whatever embodies labor; labor is the *cause* of value,—the "real price" of things.

But while Adam Smith's notion of the natural course is appreciably nearer the truth as the ordinary layman sees it than was the Physiocrats', it is very far from professing to be identical with the actual course. Thus natural values are not the values causally determined by the "higgling of

the market." But, for all that, they are the "real," the "necessary" values, and the market values are the "nominal" values, the "accidents," though a cynic might be pardoned for refusing to see wherein they were "necessary" except to establish the logical congruence of economic theory with its postulate. Of course, the gap between nature and the market is bridged, in thought at least, by the workings of self-interest. Where competition is the regulator of values a reasonable correspondence is held to ensue between the "real" and the "nominal" prices of things, and thus is vindicated the economist's claim that nature does all things well, and that, as she does them well, the logical is the "natural."

Quite as characteristic of Adam Smith's attitude is his treatment of distribution, and it is almost equally characteristic, it may be added, of the attitude of many later economists toward the same problem. The shares in distribution are to be accounted for. How is it done? Briefly stated, by construing them in terms of the "necessary" equivalence of effort and effect in production. Nature does not waste. Therefore, when the natural course of things runs off smoothly, that is to say, when competition does its part, effect must be proportioned to effort, and *vice versa;* and thus the quantitative equivalence between work and pay is neatly established. Man bestirs himself to secure a gain with no intention of assisting the productive processes of nature. But, for all that, the bargains that he drives betray him into an alliance with nature, and therewith is he led by the "invisible hand" to do his part in production and the service of society. The resulting shares in distribution are "natural." But, here again, it must not be supposed that the natural and the actual correspond in Adam Smith, least of all in that state of actual society which follows "the appropriation of land and the accumu-

lation of stock." Nevertheless, the distribution in question is "natural," because it falls in with the author's preconception of the orderly course of industry.

If it be asked whether the term "natural," as employed by Adam Smith, implies the same unmitigated approval as with the Physiocrats, the answer must be "No." In general, the "natural" means "what ought to be," or "what is intended by a benevolent Providence." But some telling passages might be quoted to show that Adam Smith's enthusiasm for the "natural" is considerably tempered by his noting the action of other plain, homely, matter-of-fact causes, even under the "system of natural liberty." The case of the landlord is one. His "rent costs him neither labor nor care." So, again, "the interest of the dealers in a particular branch of trade or manufactures is always in some respect different from and even opposite to that of the public." The persistence of these and similar cases were troublesome items in Adam Smith's system. They must have offended his nice metaphysical sense of fitness. But it is greatly to his credit that he did not attempt to ignore them, and was willing to sacrifice symmetry to truth. That would have offended his dispassionate practical judgment still more. He is willing to let these blemishes stand as exceptions to the beneficent trend of things. And in this respect he is better than some of his followers.

But yet, looking backwards, the metaphysical animus in Smith is strong. The notion of a natural economic order guided his thinking as it had done the Physiocrats'. But his natural order was the result of the free and spontaneous action of individual interest, acting, of course, under the constraint of Providence. This idea of efficient self-interest was his specific innovation, and his legacy to his followers. They seized upon it, and, informing and strengthening it with a new philosophy of the human mind, made it the basis of the classical system.

With the turning of the century, the constitution of economics experiences a substantial change, adding to its premises and shifting its attitude, but not in any such thoroughgoing way as to divest it of its metaphysical character. It is still a science dependent on the apparatus of preconceptions and postulates.

The leading figures in economics at the beginning of the century are Malthus and Ricardo, and they, with Adam Smith, are usually represented as the great triumvirate that gave to English political economy the character that it has held ever since. But it seems doubtful if either Malthus or Ricardo has exerted a greater influence than the great Utilitarian who was the tone-giving influence in nearly every department of English thought for at least one half of the century. To the influence of Bentham's teaching the science owes that peculiar constitution which has given rise to its characterization as "the mechanics of natural liberty." To that same influence seems due the shifting of the center of interest from the analysis of production to the theory of value. To him, also, is due the rapid rise to ascendency of the abstract deductive method. And to his teaching in particular we owe the creation of that bondman of the science, the economic man. No doubt, other influences also contributed to these changes. The incorporation of the law of diminishing returns and the principle of population into the premises of the science are to be especially noted. As limiting conditions of the environment within which the economic action of man was noted they also served to add emphasis to questions of value and distribution, and, besides, imported a strain of pessimism into economic thinking. But no other influence was paramount to the influence of the new habits of thought, the foundations of which were so convincingly set forth in Bentham's *Principles*. That influence was deep and per-

vasive.[1] It was during the reign of Benthamite utilitarianism that English political economy achieved its greatest triumphs and worked its way to an authoritative position in Great Britain as a foundation for public policy.

The specific innovation that utilitarianism accomplished for political economy was the substitution of utility for providential design as the basis of theoretical formulations. Bentham gave to that metaphysics of human nature which had already emerged in Adam Smith a matchless statement, an impregnable setting. It became for political economy a first principle. Adam Smith had shown how the actions of individual men, each seeking his own gain, inevitably promoted the public interest. But Adam Smith was no utilitarian. It was to only one class of actions that he assigned self-interest, and even there self-interest was but a wheel in the mechanism through which nature sought her ends. With the school of Bentham, however, "there is no true interest but individual interest," not only in the region of business, but throughout the whole of life. Self-interest is, therefore, not a method of nature; it *is* nature.

To Adam Smith's followers, the *Wealth of Nations* was a sacred text. But like other sacred books, it was not above interpretation. At the opening of the century the succession to Smith was in question. Malthus and Ricardo were aspirants for the leadership. Of the two, Malthus stands much nearer Smith in his philosophical preconceptions. Like Smith, he imputes a purpose and constraining guidance to nature. But the victory went to Ricardo. He is a layman in philosophy, coming by his preconceptions tacitly, like many a later economist, through a simple process of absorption. That is, perhaps, what makes him so

[1] It need scarcely be added that the influence upon the constitution of the science here attributed to Bentham's teaching was not exercised by his own economic writings, important though they were, but sprung from his general philosophic standpoint, which found such ready assimilation and bore such characteristic fruitage in the institutes of economics as developed by Ricardo, Senior, and McCulloch.

significant an exponent of the change in the point of approach that was taking place in the science. Ricardianism is Benthamite utilitarianism turned economic. It was given to Bentham to formulate the new articles of faith; to Ricardo to use them.

In the hands of Ricardo and the disciples of Bentham, economics ceases to be a theory of the natural order and becomes, what was already foreshadowed in Adam Smith, a theory of the workings of human nature, but of human nature construed in hedonistic terms. Human nature is regarded as a competent mechanism for transforming the effects wrought upon it by the forces of the environment into an equivalent amount of conduct. Human action is viewed as inert, mechanical reaction, the effect in conduct being always quantitatively proportionate to the cause. This being the general position of Hedonism, the particular office of each of the sciences living under its dispensation was to show in detail, in its appropriate department of activity, how this reaction takes place. And since the process through which the human agent translates the adequate cause into its appropriate effects is obviously a valuation process, economics ceases to be primarily a theory of production and becomes a theory of valuation. Its principal problem is not to discover the causes of the productiveness of industry, but, as Ricardo puts it, to "determine the laws which regulate distribution." Value ceases to be regarded from the side of production and production becomes a category of value, and political economy takes a long step towards attaining, in appearance at least, what Professor Marshall three quarters of a century later describes as its proper goal,—a theory of the equilibration of economic forces. In keeping with this change of base, value is no longer conceived as that which avails towards production, but as that which avails towards exchange. Labor falls

from being the cause of value to being merely its measure. Value being taken as the earmark of wealth, the Ricardian economics becomes a theory of acquisition, attention being given to the money-making propensities rather than to productive activity. The distinction between industry and business, between making things and "making money," is obscured and neglected. Archbishop Whately designated the essential interest of the utilitarian economics when he proposed the name "Catallactics"—the science of exchanges.

But however considerable the changes thus wrought in the theoretical structure of the science, the adoption of the utilitarian conception did not destroy or seriously damage the belief in a meliorative trend in events. The fact of diminishing productiveness and the law of population made it far from easy for the Ricardians to contemplate the "natural advance of society" with the unmixed satisfaction of the Physiocrats and Adam Smith. But utilitarianism, with its "greatest good of the greatest number" and "every one to count as one," saved the day for the system of natural liberty. Since society is the sum of its individual men, and the collective interest is the sum total of individual interests, it follows for utilitarian economics that each individual, in pursuing his own private interest, is also furthering the social good in the most effective fashion. And consequently the natural laws of the science under its utilitarian organization, though they have lost something of their former coloring and unimpeachable authority, are still uttered in a sense that usually implies approval, even though in a greater degree than before they are expressed in the dry and conventional language of science. Competition makes for the happiness of the greatest number, therefore, the natural laws of political economy, which are the laws of competition, carry with them the suggestion of precepts.

So long as utilitarianism maintained its position unimpaired, economic science had a clear and easy course to follow,—that is, until about the middle of the nineteenth century. During that time it advanced to a commanding position among the social sciences, because it was, of all of them, the most competent to turn the utilitarian expedient of thought to effective account in explaining the motions of men and society. Its deliverances, frequently uttered in a spirit of dogmatism, were accepted almost unquestioned. Its standing with the public has never been better. There were differences among the Ricardians on questions of theoretical detail, but nothing touching the spiritual stability of the system they had devised. New departures in economics were taken or proposed by Sismondi in France, List in Germany, and Richard Jones in England. But highly valued as the work of these innovators has been by later economists, it made little impression upon the development of the science at the time. The authority of the classical political economy was not impeached and could not be impeached by any such attacks. The time had not yet come. So long as utilitarianism was in the ascendent, the public credentials of political economy must needs be the best. But let the supremacy of utilitarianism once be threatened, and troubles must begin for economics. The old constitution would no longer avail; a change must follow.

That change began about the middle of the century and, strangely enough, was associated with the intellectual enterprise of the man who frequently has been represented as having given to political economy its most telling exposition from a clarified Ricardian standpoint,—so much so, that the English economics of this middle period has sometimes been called the Ricardo-Mill political economy. But seen in the fuller and truer perspective of time, Mill's *Political Economy* is read to little advantage and his position

is badly understood, when he is represented as merely the *"Sécrétaire de la Rédaction,"* keeping to his task with the "piety of a disciple." The truth of the matter is that Mill was at a transition in British thinking in a sense which neither he nor his following appreciated. In his hands political economy was shifting its ground, insensibly perhaps, but nevertheless unmistakably. Mill may have echoed the laws and phrases of the earlier generation of thinkers, but he was informing them with a new spirit which reflects the presence of the new influences that were affecting the thinking of his day. This is not the place to attempt an enumeration of these influences. They were several and diverse. It will answer the purpose to mention a single one connected with the decline of utilitarianism and its psychological counterpart. For this decline imported a considerable change in the outlook and status of economic science. The change in question is already foreshadowed in Mill's *Logic* (1843), where the older view that individual conduct and character are but the mechanical product of the molding circumstances of the environment is qualified so far as to allow to the individual himself an influence and responsibility in shaping those circumstances. That is to say, a teleological trend is coming to be claimed for individual conduct where formerly such a trend was looked for and found only in the sequence of events in nature. In other words, the human nature, into the workings of which the economist inquired, is being differently construed under the guidance of a changed psychology. The psychology that was making its way in Mill's time was moving away from the older associationist standpoint and approaching the position of modern functional psychology. Centering its interest in the process of attention, it teaches that cognition or perception as the attentive process always implies the presence of a purpose or interest that elicits and guides

the attention; that attention is essentially the process of examining a situation with the view to discovering what objects and conditions it contains that may be made use of for a given intended purpose. Human conduct, as viewed from this standpoint, ceases to be merely uniform, quantitative, inert reaction to adequate forces, and comes to be regarded as qualitative, purposive response to stimuli. The ethical counterpart of this revamped Hedonism, the utilitarianism of Mill, correspondingly recognizes in the motivation of human conduct differences in kind of pleasures as well as in amount, and imputes to the selective agent in conduct a continuity of purpose that gives a spiritual stability to the life process. And herewith there begins to fall away from political economy that ancient article of faith which had seen in nature, and nature alone, the consummate, beneficent trend which enabled the economist to go to his work with conviction in his heart and confidence on his lips.

It is out of the question to pursue here the modifications wrought by Mill and his following in the received version of economic doctrines as a result of the change in their mental attitude. To one of these, though it is far from being the most significant, Mill himself calls special attention. It is the distinction he draws between the laws of the production of wealth and the laws of its distribution. The first are "real laws of nature dependent upon the properties of objects" and cannot be modified; but the second are only the "necessary consequences of particular social arrangements" and are "liable to be much altered by the progress of social improvement." Any attentive reader of Mill will recall many instances in which the outcome in the economic situation is represented as controlled or modified by other forces than mere pecuniary interest. The economic situation is far from frictionless. The many cir-

cumstances that Mill finds impeding the indiscriminate play of human competition as, for example, in his discussion of the causes of differences of value or differences of wages, are cases in point. The "counteracting forces" as well as the "controlling principles" are noticed. It is the "negligible factors" that mar the symmetry and flow of his exposition. For similar reasons the unmitigated results of gain-seeking traffic are not necessarily to be construed as good, and competition loses something of its former virtue as the natural scheme of social salvation. There is a visible shrinkage of the teleological content of the laws of political economy. They imply less of approval than formerly of the competitive process of which they are presumed to offer the explanation. They are still natural laws but with more of the limitations of later-day science,—empirical generalizations, statements of impersonal uniformities, of coexistence, and of sequence. Moreover, they are abstract laws built on assumptions and of hypothetical validity only. They are not entitled to exercise, therefore, a narrowly constraining influence on the economist who undertakes to apply them. Hence, Mill does not hesitate, in applying the principles of political economy to social philosophy, to propose some very substantial departures from what so many of his predecessors had been disposed to regard as a sovereign, natural principle of the science,—the rule of *laissez-faire*. For Mill the "admitted functions of government embrace a much wider field than can easily be included within the ring-fence of any restrictive definition; and it is hardly possible to find any ground of justification common to them all, except the comprehensive one of general expediency." Liberty and property cease to be "natural rights" and are treated as human contrivances to be tried on their merits. To the emancipated mind of Mill's day, Bastiat's *Harmonies* was an anachronism, a

voice from the past. Cairnes's impatient declaration that "political economy has nothing to do with *laissez-faire*," shows how changed was the animus of the science.

Clearly, then, the forces of disintegration were at work in political economy, and the constitution of the science, as it left Mill's hands, was a different affair from what it had been in the confident days of his father. When Cairnes some years later undertook to restore the prestige of political economy by a guarded restatement of its leading principles and an explanation of its character and methods, he believed himself, no doubt, to be walking in the footsteps of the masters. But the net result of his effort was to show how far political economy had drifted from its traditional position. The unpretentious character that Cairnes assigns to economic laws was far from expressing the ambition of the masters. The fact is that Cairnes, in attempting to give to political economy an irreproachable character, was simply sterilizing it. He set out to do for political economy what was being done in the natural sciences. In the overhauling the physical sciences were experiencing in Cairnes's day, an attempt was being made to read metaphysics out of them; and the physical sciences were in this respect serving as an example to the social sciences. Whatever success the effort to relieve science of the metaphysical taint may have had in the field of the former, the results of the innovation in political economy are not to be accounted as highly effective. Under Cairnes's dispensation political economy became not so much less metaphysical as less vitally metaphysical. The virile and imposing metaphysics of natural liberty simply gave way to an impersonal and spiritless conception of normality, and political economy becomes what it has remained for many of Cairnes's followers,—a perfect, hypothetical

science, formulations of theory in terms of tendencies, a body of so-called ultimate principles. For the average reader, Cairnes took the discussion of economics out of the older region of reality into an atmosphere so tenuous that it could not preserve the aspect of vital interest. It was a metaphysical science without a message. Political economy was losing caste among the metaphysical sciences without acquiring the sought-for status among the empirical sciences. It was neither stimulating philosophy nor good observation. It is then surprising that Cairnes should have complained that political economy had "ceased to be a subject of fruitful speculation" with the educated public, or that Bagehot should have found that "it lies rather dead in the public mind" and "no longer matches with the most living ideas of people"?

It is hardly necessary to add that all this is said with no thought of disparaging the services of Cairnes's school to economic science. His is deservedly an honored position in the history of the science and it may well be that the phase which it has seemed fit to connect with his name was an unavoidable phase in the development of the science. Indeed, there is good reason for thinking that it was. But, at best the constitution that Cairnes proposed to give to economics could in no sense become definitive, if the experience of other sciences that had passed through a somewhat similar phase could be taken as suggestive of what might be expected to occur in economics. Economics, after the middle of the century, was threatening to become a closed circle, and to come to a full stop. Such a condition could not, however, long endure in a subject of such vital concern. A reaction in some form was inevitable. What is matter for surprise in reviewing the history of the past fifty years is that the reaction, in a form competent to deliver the science and give it a modern constitu-

tion, should have been so long in coming, and that so many of the economists of the generation that followed Mill and Cairnes should have found themselves able and content to pursue their work in the spirit of the old ideals or of other ideals which, though new, were not much more to the purpose when seen in the light of those requirements which the admittedly progressive sciences of this period had, in a sense, made authoritative. Earnest efforts to regenerate economics and to recover for it something of its lost prestige have surely not been wanting. But the record, if the truth is told, is not one of big achievement or even of measurable progress when we consider the startling advances that have been taking place in other fields.

Looking first at the work of the economists of the last generation, mainly English and American, who have set themselves with special task of formulating economic theory, it will hold true, with some exceptions, that their work has been mainly work of repair and extension, rather than of fresh construction. They are the legitimate heirs of the classical tradition,—the classical school of to-day. Magnify as we will the differences that separate these later theorists from their classical predecessors, the differences are differences of theoretic detail and emphasis rather than differences in point of approach or method of attack. For them, it would appear, the science has no new mission. The problems they handle are the old ones and they handle them after much the old fashion, though, be it said, with some change in the phrasing of their conclusions. Utility may take the place of cost, and productivity that of sacrifice; a single law of distribution may do the work that once required three; but we still have the problems of the Ricardian economics, and the apparatus for handling them shows little change. It is still deductive economics of the old type, seeking by a skillful manipulation of definitions

to explain the normal case. A perfectly balanced system in which everything is reduced to order and symmetry and congruence with itself,—that is the accepted test of truth. Such, for example, is Professor Clark's *Distribution,* a consummate achievement in the art of system-making. And though the phrase "system-making" cannot be applied to Marshall's *Principles* without much qualification, it is largely because the amplitude of accessories with which he invests his treatment divides our interest with the system. Every competent reader of this monumental work knows how much more it contains than a system. But though Professor Marshall's practice is more liberal than his precept, he has made it clear on more than one occasion that the ideal he cherishes for economics is to place it on a firm foundation as a systematic science, seeking to establish a body of general principles—an organon, as he has called it—by those methods which the natural sciences of an earlier generation have made familiar. He aspires to make economics a perfect, quantitative science and would, therefore, keep value in its traditional position as the central problem of the science, to which and from which all else leads. The play of human motives working their way to a position of equilibrium,—that is the thing to be explained. Recourse is therefore taken to the analogies of physics rather than of biology, and so the science remains a mechanics of human action,—a study of balance rather than of growth,—a theory of action, no doubt, but one in which the interest centers in the conditions that limit the play rather than in the factors that vary it. No doubt, neither Professor Marshall nor his colleagues are indifferent to those considerations which the biological and anthropological sciences of our day are pressing upon the attention of the learned world. There are too many evidences in the writings of Professor Marshall, at least, of

a sincere and solicitous regard for the viewpoints of these sciences, to charge such neglect. He is read to poor purpose if it is not discovered how the notions of "continuity" and "development" in the movement of things has tempered and broadened his attitude. They are the watchwords of his preface. But for all that, when the analysis is once under way, it is not the notion of *development,* but rather that of *stability* that shapes the discussion.

The legitimacy of systematic science is clearly not to be impugned. Science it certainly is. The history of scientific endeavors in other fields shows that such work has, at one time or another, engrossed a considerable share of the attention of leading minds; but the later history of many of these same sciences shows a diminishing conviction of its present usefulness. And those that have been most successful in detaching themselves from the discipline of philosophy have given it up as an unprofitable enterprise and have taken to other and less pretentious methods. Systematic science must lose standing, because its tentative conclusions fail to satisfy that desire for concrete knowledge of things as they are which it seems to be the appointed mission of science in our day to provide. It has yet to prove its competency, in the field of social phenomena as mostly elsewhere, to present things in those aspects which modern science has taught us to regard as indispensable for their appreciation. It cuts out of the field of vision, under the name of "disturbing causes" or what not, precisely those things which interest the man on the street.

If this version of the matter be sound, it cannot but be cause for serious misgiving that so much of the intellectual energy of the economists of the present day that is being devoted to theory should have taken such a lead. It lends substance to the criticism sometimes leveled against economics by the adepts of other sciences that it is behind the

times in its adherence to outworn methods of handling its subject-matter. There seems to be room, if indeed there is not much need, for work of a different type from that which has been engaging the attention of the Neo-Classical School. Progress demands it.

And much the same may be said of the interesting diversion created by the Austrians. However much they may have done to advance the discussion of a particular detail of economic theory, albeit an important one, their achievement is not to be rated as a serious innovation for the science as a whole. Indeed, the ready assimilation of the doctrines of the Austrians into the body of the classical economics shows how near they were in temperament and standpoint to the school they set out to supplant. The movement has apparently spent its force and the science goes its accustomed way.

What shall be said of the historical movement? To it is usually accorded the place of chief importance in the history of the reaction. It made its appearance about the middle of the century with the intention of saving political economy from its unprofitable career. The movement has been variously known as the inductive, historical, or German school. It was in fact all three: historical and inductive in its professed method, but German in its essential spirit. The rise of this school is not a self-explanatory phenomenon, but it is not enveloped in much mystery. Just as the classical political economy was shaped by English utilitarianism, so the German historical economics was an outgrowth of German philosophy. In each case economics was building on the current metaphysics of the home country. Each was a distinctive national product, and the historical movement, though it has won adherents in other countries, has preserved till this day a peculiarly German character. Roscher started the movement. Reacting

from the excessive *a priorism* of English political economy, stimulated by the example of the new historical jurisprudence, and inspired by the Hegelian notion of development, he set out to reorganize economics on a broader basis. The movement that he inaugurated soon found adherents. Bruno Hildebrand followed in 1848 with his *National Oekonomie der Gegenwart und Zukunft,* and Karl Knies in 1853 with his epoch-making *Die Politische Oekonomie vom Standpunkte der geschichtlichen Methode.* Taken together, these works define the fundamental articles of the constitution of the new historical economics. They were its confession of faith. Knies emphasized the idea of the parallel development of economic ideas and economic institutions,—the idea of historical relativity. But Roscher was more ambitious; he aspired to make of economics a "philosophy of economic history" whose special function should be to discover the laws of cultural development in their economic aspects. Hegel had given to German thought the conception of organic society. According to this, society has a life-history of like kind with organic nature; therefore, the process of organic life supplies the proper analogy for studying the cultural sequence. It was a part of this conception which Roscher seized on,—that the cultural sequence repeats itself in cycles of "youth," "maturity," and "old age," each nation going through much the same course. The history of the past, therefore, is prophetic of the movement of the future; history repeats itself. The laws of historical development are the only "natural laws" of society. It is thus that history became the method of the new departure,—history, that is to say, as officially interpreted by Hegel's formula. Seen in the light of its derivation, therefore, the historical school was as much metaphysical as historical. History was to be read with a purpose. "He," says Hildebrand, "can have

no right understanding of history to whom the conditions and needs of his own time are unknown." It is the business of the economist "to discover the link which the present generation is to add to the chain of social development." The movement, therefore, from the beginning had an ethical as well as an historical import. Its self-appointed mission was to control, as well as to explain, development. It was an *historisch-ethische Richtung*. As Held stated it, the new school "demands a conception of the science, which includes social policy;" and since, according to the German view, the state is the appropriate organ of social control, the new economics was a theory of the state and its functions quite as much as it was a theory of economy and its changes.

Whether the reaction thus described is to be regarded as a far-reaching and salutary reaction in the field of economic study is not here in question except so far as it has a bearing upon the transformation of the theoretic constitution of the science. Every economist, no matter of what school, knows how much his attitude has been modified and tempered by the criticisms of the "Historiker." The "abstracter economics" has been shown its proper place, its spiritual pride has been reduced, and it has been put, as it were, on its good behavior. Every historian as well as economist knows, too, how much history owes to the activity of the new school. If it has turned out much lumber, of which nothing better can be said than that it is scholarship, it has also given some noteworthy and vital researches of the highest value. But all this and more that might be said to the same effect is beside the mark of our present interest. What has this school done, in a positive way, to give a new formulation of theory? Its earlier champions promised a rapid and radical transformation of economic science. Has that promise been fulfilled?

It may be said at once that so far as the activities of the historical school have moved in the orbit described for it by its founders, it has failed to make good. Economic theory has not experienced at the hands of the exponents of the new method the reorganization of which it stood in need. Institutional history is not economic science. A narrative and descriptive account of things is not a scientific relation. The theory of institutions requires that these should be accounted for in terms of determinable cause and effect. A causal sequence implies very much more than historical succession. So far as the work of the historical school has been a search after the laws of social development, it has seldom eventuated in any more definite articles of theory than such loose and sweeping historical generalizations, as, for example, Wagner's law of the increasing extension of state activity, or Held's law of the evolution of industry through the successive stages of family system, guild system, domestic system, and factory system. Such and similar guesses at "the curve of economic evolution" may be useful for the purposes of the economists who use them, but they do not make good the claim of their inventors that they "see things as they actually are," "free . . . of all *a priori* theories."[1] The frankly avowed preoccupation of many members of the school with learning the "significance and appropriateness" of things discredits their theoretical work no less decisively than it does that of the Manchester school which they set out to supplant. The doctrines of the one are as unmistakably of metaphysical derivation as those of the other. But since historical induction seems a less competent contrivance than abstract deduction for turning a metaphysical postulate to rapid account in the formulation of theory, the

[1] So Professor Ashley in the preface of his *English Economic History*. *Cf.* also the same author's inaugural lecture on the *Study of Economic History* printed in the *Quarterly Journal of Economics*, vol. VII, especially p. 136.

theoretical output of the historical school has been notably small. Indeed, many of the schools appear to have given up the profession of theory, being content to use as their working principles, when the occasion arises, the body of doctrines worked out by the later economists of the classical trend. It was such a change of heart, no doubt, that made it possible for Professor Wagner,[1] some years ago, to express such ready acquiescence in the work of Professor Marshall. It would appear, from this and many other symptoms, that the large group of historical economists for whom Wagner speaks has abandoned the field of theory and taken to other work.

When, however, we turn to the branch of the historical school of which Professor Schmoller may be taken as the representative, we meet a different situation. There is much in the later activity of this branch that is of promise for the future of economic theory, and much that sets it apart from its own past as well as from the conventional line of the historical trend. Taking at the outset a position so radical that it drew from his colleagues the characterization of "extreme Historismus," Professor Schmoller yet stands to-day as one of the foremost workers in the field of theoretical construction. Whether or not such an outcome was to have been expected as a result of the interest that has hitherto engaged the activity of Professor Schmoller and his school may be doubted. It is well known that Professor Schmoller began his career by discouraging all attempts at theory as premature and ill-advised until an extensive equipment of historical, statistical, and other material should have been provided; and his utterances on different occasions left no doubt that this preliminary work would need to be done with such exhaust-

[1] In a review of Marshall's *Principles of Economics* published in the *Quarterly Journal of Economics*, vol. v, p. 319.

iveness as to absorb the energy of at least one generation. An eventual formulation of results was avowed to be the end in view; but the long-continued and painstaking devotion to history, and the easy avoidance of theory, gave much ground for the belief that history rather than theory would always be their characteristic product. Indications, however, have not been wanting in the writings of Bücher, Knapp, Sombart, and others, that history was not to be the last word of the school, but the pathway to construction. Above all, the work of these gave substantial promise that the theory at which they aimed would not rest with empirical, historical generalizations, but would lead to laws of causal sequence. It is this latter aspect that makes German economics, as seen through Schmoller's *Grundriss* or Sombart's *Moderne Capitalismus,* of such significance for economic theory. The function of economic theory, as these men appear to understand it, is very different from the conventional view. Professor Schmoller made it clear some years ago, in a review of the Austrian doctrines, that he could not regard the problem of value as the main preoccupation of economic theory. For him, the economic process includes much more, and much of more significance than the process of valuation. What he aspires to offer is a theory of institutions, more specifically a theory of the factors that have shaped the successive phases that make up the life-history of these institutions, and the outcome, as we have it, in the existing situation. The economic situation, as Professor Schmoller views it, has nothing definitive about it. Institutions are regarded as a part of the conventional apparatus of life. They are still in the making, therefore, and always will be; and they are not accounted for by representing them as functions in an orderly and rationalized eternal scheme of things. They represent the accumulated influence of a complex of forces whose

shifting play is to be ascertained by a careful scrutiny of the exigencies under the stress of which the process of institutional adaptation has taken place. The interest centers, therefore, much more in the origin, variation, and survival of institutions and habits, so far as these determine or *are* the economic situation than in their present working or efficiency as rated by some conventional standard. The result is, therefore, to be described as a genetic rather than an historical account of institutions,—a natural history of institutions in their economic aspects, the chronological sequence always giving way to the causal sequence. The point of view is that of evolution rather than of "historical development," the discussion habitually following the lines that evolutionary science has made familiar. Elaborate notice is taken of such features and circumstances of environment as have an appreciable bearing upon the economic life-process, and a no less careful regard is paid to the changing makeup of human nature, for it is the complex interaction of man and his environment that issues in institutions. Neither environment nor human nature is treated as a given fact invested with stability. They each change, both as cause and effect, and their interplay is therefore to be conceived and described in terms of process and not of fixed condition.

For such a survey of the natural growth of institutions, history is of obvious importance. It describes the field of investigation; but more than history is needed. One has only to turn the pages of Professor Schmoller's *Grundriss* to see how widely he has ranged in fields of knowledge that lie beyond the conventional frontier of economic science, as it has usually been cultivated by economists of either the historical or the classical trend. Geography and geology are pressed into service to explain environment, as ethnology and psychology are to explain the human factors.

It is the habitual resort to knowledge of this kind, to explain the economic situation, that gives to this latest enterprise of the leader of the historical school its peculiar and striking character. Indeed, this most recent example of Professor Schmoller's method marks so much of an innovation upon the historical method, as it hitherto has been conceived, that it is questionable whether it should be called historical economics. What it is called is, however, of secondary interest. The fact that is of moment, and that is to be signalized in following the progress of our science, is that we have here a new type of economics, a type that attempts, and with appreciable success, to carry into the study of economic institutions something of the spirit and method of the later-day sciences.

THE SCOPE AND METHOD OF POLITICAL ECONOMY

BY JACOB H. HOLLANDER

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THE development of economic thought has been affected at intervals by more or less formal consideration of the relative extent of its subject-matter and the proper scope of its inquiry. Originally conceived as the art of domestic government, political economy became at the hands of the Physiocrats and their immediate precursors a systematic study of the phenomena of wealth. Two influences, emanating from the philosopher-scientists of the early eighteenth century and together summed up in the historic ambiguity of the term "natural," contributed to this end. First, the existence of economic uniformities was asserted; and second, the possibility of basic rules of social conduct was assumed. Similarly, Adam Smith, starting from an academic discussion of "Police," in logical development of the teachings of Pufendorf and Hutcheson, passed, with

growing sense of the importance of the subject and under the personal stimulus of the *Economistes,* to a full consideration of national well-being. Professor Sidgwick has pointed out how this transition from political economy as an analysis of wealth phenomena is actually crystallized in the *Wealth of Nations.* Explicitly defining the purpose of economic study as the first, Adam Smith in fact devoted the bulk of his treatise to an analysis of public well-being.

This drift of political economy away from rules of economic administration to an analysis of wealth phenomena was aided by the intellectual reaction that followed the excesses of the French Revolution. Economic doctrines and, preëminently, the doctrines of the new economic liberalism, were identified throughout Europe with French principles and the revolutionary spirit. In 1793—three years after Adam Smith's death—Dugald Stewart still hesitated to give, even before a select audience, any detailed account of the *Wealth of Nations.* And Mr. John Rae cites Lord Cockburn's testimony to the fact that, when Stewart first began to give a course of lectures in the University of Edinburgh on "political economy" in the winter of 1801-02, the mere term "political economy" made people start. "They thought," he says, "it included questions touching the constitution of governments, and not a few hoped to catch Stewart in dangerous propositions."

But the determining force in the transition of political economy from a body of precepts to a body of principles was the circumstance that, with the dawn of the nineteenth century, the analysis of wealth phenomena ceased to be exclusively the concern of pamphleteers and special pleaders, and became the subject of deliberate and systematic study by a widening circle of keen and influential minds. The *Wealth of Nations* required too much thought and reflection to be popular, lamented David Hume within a month after its

appearance, and the readers of the day, fresh from the pages of the *Decline and Fall,* might well have found the Scotch philosopher turgid and prolix. But by 1800 the work had reached a tenth edition; its influence upon political thought was evident; its impress upon political action was in part realized, in part foreshadowed; Dugald Stewart's lectures at Edinburgh were crowded, and young men like Francis Horner, Samuel Romilly, Sydney Smith, George Grote, James Mill, David Ricardo, and Thomas Robert Malthus were turning from natural science, from legal studies, and from literary activity to earnest pursuit of the subject whose prosecution not only involved keen intellectual pleasure, but whose results stood in intimate relation with urgent practical affairs.

It is doubtful whether economic study has ever been pursued with the same intentness and enthusiasm as in England during the period, roughly speaking, of the Continental War. The reflection is seen in Mrs. Marcet, in Maria Edgeworth, and in Harriet Martineau. "It is now become high fashion with blue ladies to talk of political economy, and make a great jabbering on the subject," wrote Maria Edgeworth in 1822. And again: "Fine ladies require that their daughters' governesses should teach political economy." "Do you teach political economy?" "No, but I can learn it." "Oh dear, no; if you don't teach it, you won't do for me."

Indeed, contemporary evidence abounds. For example, Francis Horner—that brilliant young scholar-publicist whose too early death surely meant grave loss to the progress of economic truth—had read the *Wealth of Nations* before he was seventeen, had followed Dugald Stewart's lectures in Edinburgh thereafter, and was devotedly engaged in economic study while practicing at the bar in the Scotch capital.

He describes in his journal under date of April 30, 1801, his systematic manner of approach: "In the afternoon Lord Webb and I made our second attack upon Smith's *Wealth of Nations,* and finished, for the present, the subject of the division of labor. Our mode of reading is, first to go through each chapter with a minute attention to the accuracy of the argument, endeavoring at the same time to recollect all the illustrations by which we can either confirm, contradict, or modify his general principles; when we have read as many chapters as make a complete subject of itself, we review the whole in a more general manner, and take a note of such subjects of future investigation as seem necessary to complete the theory." From the detailed study of Adam Smith, young Horner passed to the writings of the *Economistes,* finding comfort in Lauderdale's remark that he (Lauderdale) "had repeatedly left the study of the *Tableau Economique,* cursing himself for a block-head." When Adam Smith's perplexing fifth chapter on value and price proved a maze, he sought the clue in the currency tracts of Rice Vaughan, Harris, Bodin, Lowndes, and Locke.

It is to this fact of earnest and enthusiastic study, rather than to any formal principle of schematization or methodology that we must ascribe the Ricardians' easy use of the term "the science of political economy." When Ricardo writes to Hutches Trower: "I am very sorry to be obliged to agree with you that there are a very few who are perfect masters of the science of political economy," or when he states that it is in the domain of taxation that "the most perfect knowledge of the science is required"—the concept of science which he has in mind is a body of principles relating to the production and distribution of wealth, obtained by systematic observation of actual phenomena on the part of a group of capable minds and made useful by

affording governments the possibility of wise economic policies.

Sixty years after the *Wealth of Nations* was published, at the very close of the first half of the century and a quarter that go to make up the modern history of economic study, virtual unanimity had been reached as to the changed purpose of economic inquiry. Rules of governmental conduct had passed from primary to secondary endeavor, and conceived as a science, political economy has become the study of the phenomena of wealth, having for its object the formulation of a body of abstract principles which should be capable in their application of shaping public policy in economic affairs.

In 1837, Senior formulated the distinction by differentiating *theoretical political economy,* which "explains the nature, production, and distribution of wealth" from *practical political economy,* which "ascertains what institutions are most favorable to wealth." John Stuart Mill and Cairnes took practically the same view, and with them, and after them, the majority of English writers of the earlier school.

The tranquil acquiescence into which economic thought had thus fallen in the late thirties with respect to accepted *dicta* of the province and subject-matter of the science, was rudely shaken in the course of the next generation by three distinct influences, about which center the sustained and often acrimonious discussions of the proper scope and method of economic science that constitute a distinguishing feature of the second half of the modern history of economic thought.

From France came the message of the unity of social phenomena and the concept of a master science of sociology. From Germany came protest against the doctrines of economic universalism and perpetualism, and insistence

upon the principle of historical relativity. From England came the gospel of economic development and the evolution of industrial organization. Comte, Roscher, and Spencer, with their prototypes Hegel, Savigny, and Darwin, represent the great forces that, in succession, first shook the structure of economic science to its very base, and then inspired its extension and fortification.

We are still too near the scene of conflict to require any review of its events. As so often in the history of science and, preëminently, in the history of economic science, that which had come to overthrow, remained to influence and to be influenced. The principles of industrial evolution, of economic relativity, and of social interdependence entered into the very heart and essence of economic study and left their mark in a changed and bettered condition. If the din of doctrinal battle no longer resounds, it is not because of abandonment or surrender, but because a sane and honorable *modus* has been arranged.

In but one corner of the field does the struggle yet continue. A handful of doughty spirits are still bravely hammering one another in theoretical determination of the precise bounds of economic science. Yesterday it was as to the interrelation of economics and ethics; the day before of economics and mathematics or statistics; to-day it is the respective provinces of economics and sociology on the one hand, and of economics and history on the other.

To this sustained dialectic I shall venture no further contribution. Whatever advantages, in the nature of precision of thought and economy of effort, attend the solemn partition of an undiscovered country must long since have been attained. Further debate suggests the waste of scholastic controversy, barren in result and mischievous in the suspension of positive investigation, in the blunting of mental acumen and in the diminution of public respect.

A far more promising service than the text-book demarkation of the kingdom of knowledge seems to lie in a comparative survey of what, in default of a more exact phrase, might be termed the "pace" of economic science. Political economy has for a hundred years or more been "a going concern" the subject of sustained and deliberate study. It seems high time to pause and inquire as to the relative efficiency of its devotees. In what relation does the achievement of the economist stand to that of his fellow scientists? According as he has forged ahead or fallen behind, the economist must teach to or he must learn from those who are speeding to the same goal, although by other courses.

If recourse be had to the readiest empirical measure—public estimate—we are left in no manner of doubt that the progress of political economy, as tested by the practicability of its application, has been incomparably slower in degree and less in result than that of coördinate sciences. For example, at the present moment there are three great economic problems disturbing the consciousness of the American people: Trusts, Tariffs, and Trade-unions. It should be as natural and proper for the public mind to turn to the scientific economist for specific and definite guidance with regard thereto as for the farmers of the arid regions to harken to the physicist as to the efficacy of concussion as a means of rain-making, or for a municipal administration to turn to a pathologist for counsel as to the best method of dealing with epidemic smallpox. Each of the three economic problems can be simplified, if not solved, by the determination of an underlying principle. The public will know how to deal with industrial combinations when an answer has been given to the query: "Is there an assignable limit to the size of the modern industrial unit, and if so, what determines it?" The tariff

question will speedily enter upon a new era if clear light be thrown upon the precise relation of labor-cost and industrial efficiency. The *crux* of trade-unionism is the determination of a natural law of wages and, no less important, a practicable method of ascertaining it. In each of these directions the economist might properly be expected to meet, indeed to anticipate, the public appeal for counsel; and in each of these directions the economist, within the ken of the ordinary man of affairs, has been mute.

Unless, therefore, the economist is to acquiesce with a resigned fatalism in a condition of affairs, of which my illustrations are, I believe, fairly typical, it is imperative that there be profounder searching of heart and more accurate scrutiny of fact for explanation of the loss of popular respect for economic study, and for the decline, at best partially arrested in our own day, of the economist's influence in public affairs.

A generation ago, Arnold Toynbee asserted that "the wage-fund theory was the great cause of the unpopularity of political economy among working-men." More recently, President Hadley, after deliberate inquiry, explained the smaller practical influence of the economist in government and administration as due, first, to the transition of political economy from an art to a science with a corresponding loss of clearness and precision in its propositions; second, to the use of precedent rather than scientific analysis by the courts as the basis of the adjudication of modern economic problems; third, to the neglect of collective interests and to the checks upon administrative power in the organization of modern representative government.

But whatever truth resides in these analyses—and there is much—fundamentally and in the last instance, the distinctly, nay, the distinctively unfavorable attitude of the

public mind towards economic theory can only be due to one or more of four causes:

First, the public mind may be inherently opposed to accept scientific leadership in the formation of its economic opinions in something of the same sense that the late Mr. Spencer noted that men who would instantly disclaim judgment in problems of the natural sciences, would, without correspondingly greater equipment, give out-of-hand verdict upon complex questions of social policy. Or, second, it may be that economic phenonema in their complexity, variety, and inaccessibility defy, beyond a certain point, that productive systematic inquiry which we term successful scientific study. Or third, the tribe of economists may be intellectually inferior to their fellow scientists, or at least less well equipped in those particular mental requisites which go to make up the successful scientist. Or, finally, the methods and the apparatus employed by the political economist may be relatively inefficient.

If political economy as a subject of scientific study has any right to be, we must of necessity reject the first three of these hypotheses and concentrate our attention upon the fourth. Such a procedure is, moreover, encouraged by the complexion of existing facts. It requires the barest observation to realize a startling contrast in method between political economy and any of the actively pursued natural sciences. Let us turn for a moment to chemistry, where within recent years the bounds of organized knowledge have been extended with the most brilliant results. In so far as the layman may speak, it appears that modern chemical—or for that matter, physical or biological—study involves three consecutive stages: (1) Inquiry and research; (2) experiment; (3) theorization. Associated with these essential activities are the complementary processes of initial conjecture affording a tentative working-

plan; formation of trial hypotheses in result of investigation and for submission to experiment; and conversion, by demonstration, of theory into law. But, in the main, chemical science advances from truth to truth, from probability to certainty, because a body of mature workers, equipped with intimate knowledge of the achieved, are busy marshaling and classifying facts, searching for and formulating uniformities, testing hypotheses, and demonstrating laws.

If we return now to the domain of economic science and to the scene of economic study, the contrast is fairly startling. We find a body of capable and devoted workers, and a definite and inviting subject-matter. But here, to any appreciable degree, the parallelism stops. There is in collecting and classifying related data, no tentative selection of economic uniformities, no verification of hypotheses by reference and experiment. As against the chemical investigator in his laboratory, deliberately and systematically gathering a particular group of facts, and formally submitting the sequences which they suggest to comparison and test, with a reasonably well-established hypothesis as the ultimate endeavor, we have a corps of student apprentices busy upon historical and institutional monographs, a group of younger scientists absorbed in academic duties, and a body of sages engrossed in doctrinal discussion. A single category has rarely been used to include two things less identical than the term "scientific" in reference to chemical and economic study, respectively. If the one be, the other is not. It is a difference in kind, not in degree of which the contrasted terms "deductive" and "inductive," "experimental" and "*a priori*" suggest the consequence, not the cause. Some further interpretation of this remarkable distinction is demanded.

A score of years have elapsed since the coincidence, roughly speaking, of economic investigators and economic

issues effected a renaissance of economic study in the United States, synchronized, let us say, by the organization of the American Economic Association in 1885. Within that period every important university of the country has found it necessary to provide more or less abundant opportunities for economic instruction, increasing numbers of capable students have gathered for training in economic investigation, and economic science in the United States has come to be studied with a vigor and an activity unequaled in any European country and unsurpassed in the case of any of the natural sciences in this. But the method of investigation has been narrow. On the one hand we have permitted the Comptian influence and the "extreme Historismus" of the German school to justify economic microscopics; and on the other hand, dismayed by the vast area, the extensive activities, and the scattered data subject to economic inquiry, and poorly equipped both on the score of requisite resources and opportunities, we have deliberately refrained from attempting comprehensive induction.

In consequence, economic investigation in the United States, although pursued with unexampled activity, has been in the last twenty years almost exclusively historical or institutional on the one hand, and local or intensive on the other. Of extensive economic investigation, economic description in the proper sense of the term, little has been attempted and less achieved. The historical evolution of economic institutions as revealed in more or less accessible records, the functional activity of economic organizations as displayed in limited areas—these have defined the scientific activity of the ordinary economist. Of the comprehensive study of the history, structure, and functions of any actual part of the economic organism, we have had infrequent examples.

In the field of local finance, for example, we have had, on the one hand, faithful historical studies of the finances of particular states and cities and of particular fiscal institutions, and, on the other hand, we have been given intelligent analyses of the present financial status of specific localities. But the investigator has probably not yet attempted—understand, I do not say *completed*—an exhaustive study of local finance in the United States, in the spirit in which we may conceive the chemist or the physicist approaching a kindred problem. Similarly, the institutional history of the Negro in certain states has been traced and his present status in certain limited localities has been described. But the larger subject, the Negro in the United States, taken in its scientific entirety, is still untouched.

Turn where we will, a similar condition prevails. Railroad transportation, trade-unionism, taxation, industrial combinations, tariffs, as fields of investigation, have been approached only fragmentarily, historically, or locally. Brought face to face with extensive subject-matter, economists have shown the white feather and solaced their souls in the thought that comprehensive study of any important economic institution might properly be postponed until such number of detailed monographs, dealing with specific aspects of the subject, have been completed as will permit full exposition and safe generalization.

Monographs have multiplied; doctoral dissertations have accumulated, and the progress of economic science, as judged by results, has been inadequate. The experience of twenty years seems to suggest that the prime usefulness of intensive economic studies is educational and local, and that variety of approach, distinctness of treatment, and change of environment are grave qualifications, under existing conditions, of the value, and certainly of the economy, of large reliance upon this monographic method of economic investigation.

The proposition which I venture to submit is that the time has now arrived when, without any necessary cessation of historical and local studies, the economic investigator,—and in particular the economic investigator in the United States,—if he is to attain his highest scientific possibility, must adopt a larger mode of inquiry, a mode analogous to that employed by the natural sciences, and described as extensive or experimental rather than intensive or historical. He must derive his subject-matter not from past history alone, nor from the present experience of restricted localities; but he must observe and collate the phenomena under consideration from an area practically coextensive with their manifestation; he must interpret each group of facts in the light of the conditions prevailing in that particular place, and he must test the uniformities revealed by reference, as tentative hypotheses, to conditions in still other localities.

If he is attempting safe and useful generalizations, he must consider, for example, the taxation of corporations not by one state but by every state. He must study the structure and functions of trade-unions, not with respect to a handful of labor organizations and a few convenient cities, but in the light of the policy and practice, declared and actual, of every important national labor-union as displayed in many representative localities. In a word, the basis of economic induction must henceforth be, to a much greater degree than heretofore, qualitative data, amassed as deliberately and laboriously as chemical or physical data are collected by the natural scientist in his laboratory, and at least approximating in comprehensiveness the quantitative material which the public statistician makes available with increasing efficiency.

The successful conduct of economic investigation along the extensive or experimental course thus outlined involves

the use of a group of workers, instead of the individual student, as the unit of research. Until such time as the number of independent investigators shall have greatly multiplied, the well-equipped department of political economy in the university will, naturally, be the prime agent of scientific activity. Such an economic laboratory or seminary will include not only a directing and teaching staff and a body of students actually in residence, but affiliated workers in the field and associated beneficiaries of subventions, desirous of operating from an academic base. A particular body of contemporary economic phenomena will be selected for collective rather than coöperative investigation; and specific aspects thereof will be assigned to individual workers for research in accordance with an organic plan. A student showing special interest in or capacity for investigation along lines other than that selected for collective effort will be encouraged to follow his particular bent; otherwise his energies will be directed, by deliberate assignment, to the seminary topic. Class instruction and the use of bibliographical and documentary materials will serve as the preparation for systematic laboratory and field work.

In regard to books and documents, the investigator must be able to command, in addition to ordinary library apparatus, all primary documentary material relevant to his inquiry, whether it be as ephemeral as municipal reports and trade-union journals, or as unobtainable by formal request as trade agreements and corporation record. Similarly, he must be able to publish the results of his investigations in the precise form which scientific fidelity or practical usefulness demands, without regard to their commercial attractiveness or to the limited resources of existing scientific agencies. A more liberal policy of library administration and a more intelligent appreciation of the proper

relation of publication to investigation in the social sciences, have notably improved conditions in the past few years with respect to these two requisites.

It is with respect to field and experimental work that the occasion for largest change exists. Descriptive investigation, as distinct from historical study and local inquiry, must bear the same relation to political economy that field work does to geology and the clinic does to medicine. The immediate environment should first be utilized as an economic laboratory for the development of scientific spirit in economic study and sound method in economic research, and as the field from which bases of working hypotheses may be derived. Thereafter the investigator must extend the range of his inquiry by visits to and even residence in representative localities, with a view to collecting wider and more varied data and to testing tentative conclusions.

Such a procedure involves two essentials,—leisure and resources. The investigator's time and energy, if not entirely available for scientific inquiry, must certainly not be unduly absorbed by the routine engagements of the student or the teacher. To the extent that he is still a student or instructor in academic attendance, opportunity for extensive inquiry must come with greater prominence of field-work and laboratory exercise in economic instruction. Economic teaching can properly harken to the message of the physical sciences, that the ideal of student training is less the accumulation of detail than the development of a mode of thought. An association of courses, a reduction of lecture attendance, a unification of seminaries, and, most important of all, the utilization of the long summer recess for field-work, will ordinarily effect an economy of time, making possible that amount of experimental inquiry demanded both by student development and scientific progress.

With respect to resources, the investigator must be in command of funds sufficient to enable him to visit, and upon certain occasions temporarily to reside in representative localities, for the purpose of gathering additional evidence and of testing and verifying tentative conclusions. To some extent, such funds can be made available by a modification of the fellowship system, the original purpose of which, the attraction of students to post-graduate study, has ceased to be necessary, and the further extension of which along existing lines threatens serious evils. Beyond this, aid may be anticipated from coöperation with governmental agencies and with endowed institutions of research. But most of all, university authorities must recognize that "investigation funds" are as essential to scientific activity in political economy as laboratory apparatus is to chemistry and clinical provision to medicine. I have elsewhere ventured the opinion that "less and less will lack of material resources operate as a handicap," and that "as long as the method be sound and truth light the way, economic investigation will probably receive as generous an equipment as the economic investigator deserves."

In short, I urge a complete parallelism in method of investigation between political economy and natural science. Comparative study can fairly well replace deliberate experiment—certainly in a country as varied in resources and institutions as the United States. Beyond this, we need but a larger equipment and a common spirit. Heretofore the economist has adapted his method to his resources. Let him now demand resources, made necessary by his method.

The significance of this great Congress is that every branch of science is but a facet of truth, and that every aspirant is in motive and endeavor as his fellow. No wise man will say, "I have the true path and every other is false."

But just as surely is he a blind and foolish traveler who trudges along with eyes intent upon the worn stone, neglectful of the shorter course and the smoother way of him whose starting-point and whose goal are as his own.

PROBLEMS OF TRANSPORTATION

BY WILLIAM ZEBINA RIPLEY

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Trade Areas

A GROWING problem in transportation is the determination of trade areas, or spheres of influence, to borrow a phrase of international law. This is another way of stating that the problem turns upon the importance of distance in any scheme of rate-making. Geographical location is a factor in commercial competition. Most of the cases before the Interstate Commerce Commission concerning the Long and Short Haul Clause raise this issue; wherever within, or even outside, a given territory, lie a number of cities competing for business. Take the Southern States for example. What are the conditions at present as determined by the adjustment of freight rates; that is, by an arrangement patched up between competing carriers, each striving for all the traffic it can hold, irrespective of any abstract rights of competitors or of the community at large? Literally speaking, railway competition does not probably exist in the Southern States to-day; so far has consolidation proceeded. But inasmuch as the system of freight rates in force is an unchanged hold-over from a competitive

period, our statement holds good. Large distributing-centers in the East are in the field seeking business. Western cities are also actively bidding for trade, while indigenous centers of primary importance like Atlanta, New Orleans, Nashville, and Memphis are actively seeking to wrest the business of distribution from their older rivals.

This contest for trade may even descend into competition between smaller local centers either struggling against one another or against the larger cities. To be concrete, it may be a case of Atlanta against New York and Chicago, respectively; or of Denver as between San Francisco and the Middle West. Or the struggle may turn upon the rights of a secondary center, such as Montgomery, Alabama, lying between Atlanta and New Orleans. Columbus, Ohio, lying between Cleveland and Cincinnati, is similarly situated. What would be the ideal distributive system supposing the matter were referred for decision to an omniscient governmental commission with power? Precisely such issues are already before the Interstate Commerce Commission. The immediate question may be a technical one, such as relative rates upon car-load or less than car-load lots, or the relation between rates upon raw and finished products. But underlying these technical details the real question pertains to the relative rights of competing centers in certain territory.

Many elements in settling trade rivalry are, of course, entirely independent of transportation cost. Among such are native or imported enterprise, available capital, and the like; but aside from these the most important artificial factor is the adjustment of freight rates.

There is a larger amount of waste due to a neglect of the element of distance in transportation than most people appreciate. It is wonderful how circuitously freight will travel, in order to reach a certain point, when once loaded on the cars or vessel. More than this, districts may even

buy their supplies of the very things which they produce, not from themselves, but through a distant distributing-point. Arkansas is a great fruit-growing state, yet wholesale grocers are selling dried fruits from Chicago throughout its own fruit-growing territory. Some years ago one of the most enterprising shoe jobbing-houses in Virginia, doing business throughout the Southern States, was shipping its shoes made in New England to customers, not as the bird flies, but back through New York. It is not very many years since interior points in the South were supplied with Western produce in part by goods which traveled three quarters of a circle, going east over the trunk lines to New York and then down the coast and away west into the interior.

Such facts illustrating the extreme fluidity of freight are familiar to all students of this subject. As a deplorable waste in transportation, they are usually charged up to the carriers. Less attention has been given to corresponding waste in transportation due to unregulated competition, not of carriers, but of buyers and sellers themselves in the ordinary course of business.

We buy hoes, rakes, and shovels in Massachusetts made in Iowa, while the greatest manufacturers of some of these products, selling goods all over the world, are situated within our own state. Nashville, Tennessee, in selling Northern goods not only as far south as its rival, Chattanooga, but beyond and all around it. Chattanooga, in its turn, would like the privilege of similarly cutting into territory which its rivals enjoy. A great struggle in the Western field illustrates the same difficulty. A bitter competition has long been waged for distributive business between the Middle West and Pacific Coast. St. Louis and Chicago are seeking markets out on the Pacific; San Francisco and the coast cities are striving to sell not only in their own

territory, but as far east as possible, and Denver, between the two millstones, is striving to retain a few rights on account of its geographical situation. What interest in the outcome have the carriers? No adjustment on general grounds of equity or economy can be expected to appeal to them. Every economy in transportation means for them, in fact, a loss of revenue. The only satisfactory issue for them is the one that yields the most returns. The result is an appeal to the state to enforce an equitable adjustment of the matter; or, in other words, to sanction a rate adjustment which shall protect each market in the possession of its own rightful geographical advantages.

Definitions of these rights, so-called, to definite territory are well put in a recent case: "Every commercial city owes its existence to its geographical position, giving it natural advantages which make it a distributing-center or gateway for a territory, the periphery of which is established at points better served by other cities possessed of like natural advantages. As the original tributary territory of a city increases in population and advances in development, competing distributing-centers within this territory, having like natural advantages in regard to the same, responsive to a natural demand, spring into being and share in the business, each city practically getting the trade to which its contiguity entitles it. Such is the history of the cities of the Atlantic Seaboard, the Middle West, and the Pacific Coast." By such reasoning as this we find the commercial zone of a city even more exactly defined in a recent case: "Taking into account the claims of those cities (Nashville and Knoxville), the legitimate trade of Chattanooga covers a strip of territory extending northeast and southwest a distance of about two hundred miles in length by about one hundred and twenty-five miles in width. And a demand results for a rate adjustment which shall 'protect this city in her natural trade rights.'"

At this point rises a difficulty, What are natural rights of location? We may easily recognize these in the case of places like New York, New Orleans, San Francisco, St. Louis, Chicago, or Minneapolis and St. Paul. A whole chain of cities from Richmond skirting the Allegheny chain around to Montgomery, Alabama, determined by the head-waters of navigation on the coastal rivers, are likewise located where they are by act of God, but shall we say the same of places like Indianapolis, Omaha, Denver, and Atlanta? Neither one of them has any rights of natural origin. They are all railroad towns, determined in location by the intersection of carriers. They might have arisen anywhere within fifty or one hundred miles from their present *situs* and have fulfilled their mission equally well. Here, then, are two distinct classes of rights of location. The Interstate Commerce Commission, since its earliest Louisville and Nashville interpretation of the Long and Short Haul Clause, doubtless had in view real geographical rights when it consistently refused to recognize the competition of carriers among themselves as justifying a neglect of the element of distance in transportation. On the other hand, the Supreme Court has, perhaps, been predominately influenced by facts bearing upon the condition of our second class of cities, which owe their prosperity not to natural, but to purely artificial causes, along which commercial competition is preëminent. Atlanta, Georgia, is purely a railroad town, without historical antecedents, without a water course or power, without fertile surroundings, remote from the sea, and with no natural charms save climate. The location and prosperity of this most important city in the South was undoubtedly due to the preferential treatment of the many carriers who happened to meet or cross at that point. What "rights" has such a place,—a creature of the railroads,—which railroads are bound to acknowledge; or what

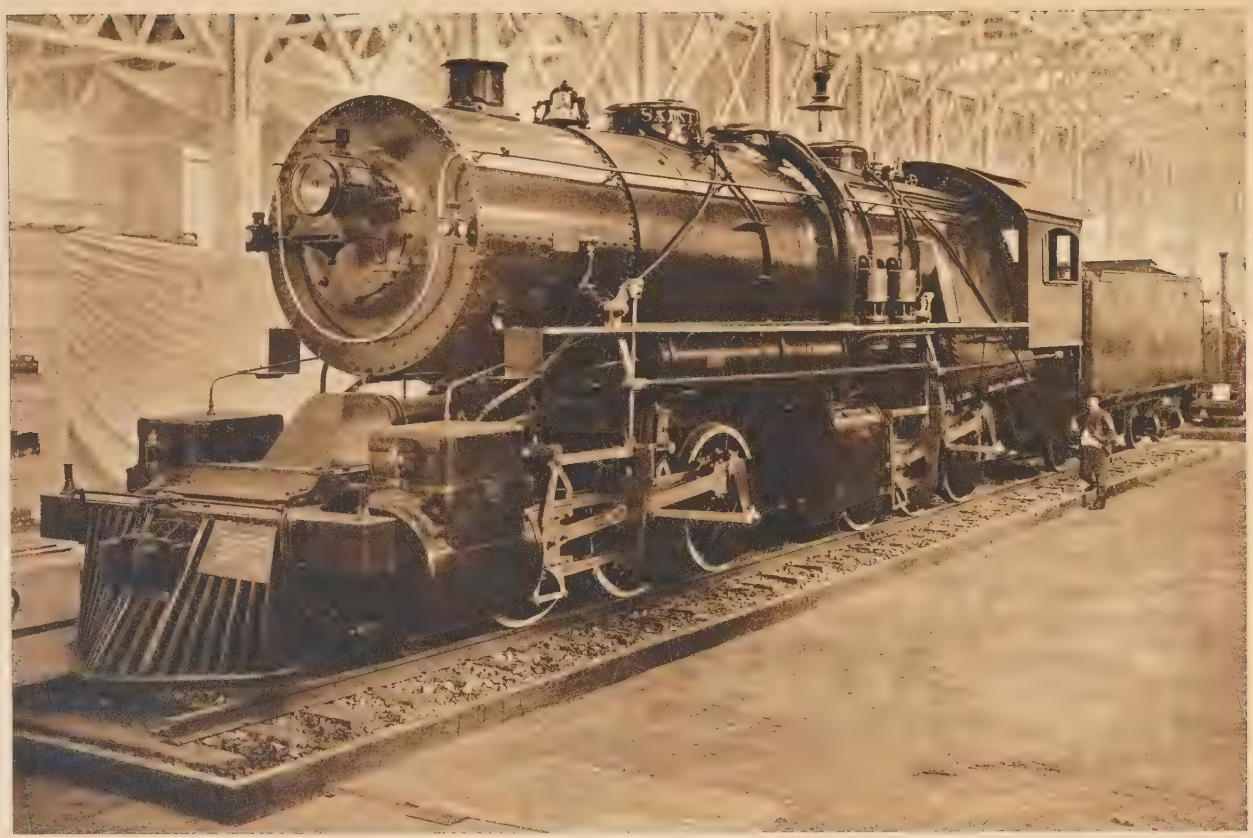
rights worthy of respect have any other competing centers which carriers will recognize as equal to the railway rights which they themselves confer?

The waste in cross-freights, competing centers invading each other's territory without regard to distance, is accentuated by the operation of an economic law. Surplus production at low cost is familiar to us in the case of international trade. The United States Steel Corporation or the German Sugar Kartel can profitably sell their surplus product abroad cheaper than at home. Within limits this foreign sale may not injure the domestic consumer, but may help to lower the price of his goods. Precisely the same principle underlies all long and short haul adjustment. It is exemplified in the case of low export and import rates. Given a volume of existing business at remunerative rates, which cover fixed charges, any surplus business which repays direct outlay is worth while. Applying this principle to our case in hand, the farther each center extends its market, the more ruinous becomes its price for the competing city which looks to that trade, not for its infinitesimal surplus profit, but for its staple and basic one. This principle not only influences the merchant in fixing his price, but it also, of course, appeals to the carrier to give lower and lower proportional rates as the distance increases.

Various industrial influences seem to be at work to prevent a part at least of this fruitless waste in transportation. Certain industrial combinations have contributed appreciably by locating their plants with reference to a division of the market and economy of freights. Others attained this end by enforcing scales of prices based on certain distributing-centers. Pittsburg, for example, is made a base for the price of pipe, plates, and other steel products. Prices for these goods are fixed all over the country at this figure plus the arbitrary approximate cost of transportation. One

THE LARGEST LOCOMOTIVE IN THE WORLD.

The photogravure herewith admirably pictures the Mallet articulated compound locomotive. This is the largest and most powerful engine in the world, designed for pushing on heavy grades. The dimensions of this veritable monster are as follows: Length of engine, 51½ feet; length of tender, 28½ feet; height of stack above rail, 25 feet; weight on drivers, 334,500 pounds; tractive force, 71,000 pounds working compound, and over 86,000 pounds working simple.



object is that all traffic may be kept moving outward from the producing-center. For obviously any shipment inward from any other distributing-center is penalized not only by lower and lower prices as Pittsburg is approached, but also by the increasing freight rates in proportion to the distance shipped backward. Still another device for correcting undue competition at ruinous distances is the adoption of a scale of crossed freights between several distributing-points. Thus Cleveland and Cincinnati, competing for business throughout Ohio, may agree, through a Wholesale Grocers and Hardware Association, to quote prices in the intermediate territory at a fixed price, freight paid; or they might agree each to figure freights as based upon a third point equally distant.

In any case the result is to give contiguity its due weight in fixing the outline of trade areas tributary to each.

Agreements between carriers often seek to obviate unnecessary waste in transportation. The division of territory between the eastern and western lines in Southern States is a case in point. Thirty years ago competition for trade throughout the South was very keen between great cities in the East and in the Middle West. Direct lines to the Northwest from Atlanta and Nashville opened up a new avenue of communication with ambitious cities like Chicago, St. Louis, and Cincinnati. The state of Georgia completed the Western and Atlantic Railroad in 1851 for the express purpose of developing this trade as Western manufactures developed. A keen rivalry between routes respectively east and west of the Allegheny Mountains into the South developed. A profitable trade on food-products by a natural direct route from the Ohio west of the mountains was, however, jeopardized by ruinous rates made by warring trunk lines to the Northern seaboard. Corn, oats, wheat, and pork came down the coast and into the South

through the back door, so to speak, by way of Savannah and the seaports. On the other hand, the Eastern lines into the South could not earn dividends because of the retaliatory rates on manufactures made by the Western lines on goods from New York and New England. Finally, in 1878, a reasonable remedy was found in a division of the field and an agreement to stop all absurdly circuitous long hauls in each other's natural territory. A line was drawn through the Northern States from Buffalo to Pittsburg and Wheeling; through the South from Chattanooga by Montgomery, Alabama, to Pensacola. Eastern lines were to accept goods only from their side of this line to points in the South also on the same side of the boundary. Western competitors were to do the same. The result was the recognition of the rights of each to its territory on the ground of contiguity.

Such action for the reasonable definition of trade areas and routes as has been outlined is feasible enough for industrial monopolies and for those carriers who by agreement or by consolidation make themselves monopolies, but the remedy is not open to the general competitive or consuming public. Merchants of Denver, Colorado, cannot conclude a treaty with competing cities for the mutual determination of one another's territory. Nor would it be desirable to have it so. Competition is the life of trade and the salvation of the public, so long as it is reasonable. The only possible geographical delimitation of each other's activities is, and must always be, through the adjustment of freight rates. This function has heretofore been performed by more or less beneficent autocracies—the carriers themselves. That so important a public function, however, affecting the origin, development, and continued prosperity of great commercial and industrial centers should remain in purely private hands without power of revision by representatives of the public, is contrary to the tendency of the

time, and cannot long persist. This does not mean that the task to be assumed by the state is an easy one, nor, perhaps, that it would be more satisfactorily performed in its larger aspects by the government than by private persons. What the situation demands, however, is not so much an immediately equitable adjustment of rights as a guarantee that the problem shall be worked out at least free from the bias of private interest. Whether more or less satisfactorily performed than at present, satisfaction must be afforded to the public that the decision is free from the bias of private interest.

Territorial Division.

All of these influences which we have adduced as making for a wider and more general dispersion of manufactures will, of course, never affect the great and unchanging influences which have placed many of our staple industries where we now see them. The several states of the Union will never probably roll their own steel rails or make their own cotton cloth. Early fruit will still grow in California and Florida better than anywhere else. Spruce trees for paper, and grain for the distillation of liquor will still grow where Nature bids. But, on the other hand, in the vast complex of manufactures, it can scarcely be doubted that a great many industries having no special *situs* foreordained will follow the population which they serve. And neglecting export to foreign countries, the business of transportation will in just that proportion be changed from long carriage for both raw and finished products to and from a specialized center, to a long or perhaps even a short haul for the raw material, and a distinctly short haul for the finished commodity. The only long haul definitely assured may be the staple food-supply, which to-day, in the form of grain, or its derivative, beef, forms perhaps one-third of the traffic of our carriers.

Are any influences yet discernible of the progress of industrial specialization upon the character of transportation in older European countries? It would be of great interest to hear from our foreign delegates.

One of the most interesting general problems for the student of transportation concerns the effect of development of facilities for the carriage of goods upon territorial division of labor, and the relative interdependence of regions or populations upon one another for products. Marshall, the great English economist, thus puts it: "Speaking generally . . . a lowering of freights tends to make each locality buy more largely from a distance what it requires, and this tends to concentrate particular industries in special localities." There should be comfort in this principle for the practical railroad man. It means several things for him. It means with the growth of a country, let us say the United States, not only an increase in the volume of traffic far more rapid than the increase of population, but also at the same time it implies an ever-augmenting proportion, not only of long-distance traffic, but also of high-grade freight. The first of these probabilities seems to be justified by the results of the decade of 1902. The average ton-mileage of the railways of the United States for the three years up to and including 1892 was 82,000,000,000. Ten years later the corresponding figure was 148,600,000,000 tons of freight hauled one mile. The increase in freight traffic was upwards of 80 per cent. During the same time the population increased about 20 per cent. Thus the volume of traffic during a decade increased about four times as fast as the population. That something like this proportionate rate of growth will continue can scarcely be doubted. Let us assume it as assured. The problem for discussion is not as to its volume, but as to the precise character which this increase in traffic will assume. If Marshall, expressing the ortho-

dox view, be right, this increment will progressively rise both in the length of haul and in character, as specialization in agriculture, mining, and manufactures develops.

Two economic forces are in continual opposition in any country. Territorial division of labor, the specialization and localizing of industry, mean an increasing dependence of men and communities upon their neighbors, close at hand, or perhaps on the other side of the globe. The trend in this direction entails an exchange, not only of raw materials, but of a larger and larger proportion of finished products. Even food staples, grain and cattle, are not carried long distances in the raw, as formerly, but largely in the manufactured state, as flour and beef products. On the other hand, with the maturer development of every community, comes an increasing desire to be economically independent and to develop resources in a well-rounded way. The Pacific Coast wants to make its own ships; the Middle West to make its own shoes; the South to grind its own flour and spin its own cotton. Every force which operates in this direction toward the decentralization of industry means a reversal of the previous effects of industrial growth in the line of regional division of labor. Every utilization of local raw materials for local manufacture to be consumed at home means a change in the character of freight offered for transport. The problem comes home every day to the traffic manager of a great system. If St. Louis shoes the great Southwest with hides of local Western origin, what becomes of the long-haul business from New England? If Richmond and Atlanta become the seats of thriving local manufacturers of furniture, crockery, wagons, and soap, what becomes of the traffic displaced? The answer is, of course, that every such industry has to be fed, clothed, and supplied in a hundred ways which more than compensate the carrier for the direct loss of traffic.

This is, of course, true. But the change exemplifies exactly what we have in mind, namely, that the maturer development of a country will profoundly influence not only the amount, but the character of the transportation service demanded as well.

Many forces tending to specialize industry and locate it predominantly in peculiarly favored places are familiar to us all. The oldest, and for our country the most important, historically, is *nearness to the market.* Nearly one-half (48 per cent) of the manufactures of the United States, according to the latest data, are located in the six states of Massachusetts, Connecticut, Pennsylvania, New York, New Jersey, and Rhode Island. But this concentration is rapidly yielding before the spread of population, with increased consumption power, through the South and West. Who can say that within a hundred years the center of manufactures will not pass beyond the Alleghenies? It has already almost done so in the case of several industries. A second concentrating influence is, of course, the *location of raw materials* in the ground and of climatic advantages in the air. There are no signs of weakening in the supremacy of Pittsburg or Birmingham as centers of the iron and steel industry.

Yet many of the more highly elaborated products of these staple raw materials, from ships to hardware, will be more and more made near where they are to be consumed. Other factors to be noted presently may readily prove it to be more economical to carry the raw material, pig-iron or steel billets, rather than the finished products over the long haul. Consider the cotton industry. We hear a great deal in New England about the advantage of having cotton grown at the mill door. Yet those conversant with the subject assure us that freight rates play no part in the differential advantage which the Southern mills enjoy over

New England. In fact for many of these mills, until very recently, it cost more to bring their raw material two hundred miles than to carry it fifteen hundred to Boston. The only real advantage for the South lies in its abundance of cheap white labor and its freedom from legislative interference in the interests of decency and humanity. *Water-power* and supply is a powerful factor making for localization in manufactures. It still determines the situation of certain industries, paper-mills for example. But our cotton-mills are more and more relegating water-power to the background in favor of coal. And, moreover, New York and New England possess no monopoly of this gift of nature. Parts of the South and West are overrun with it. Natural gas holds the glass industry within its belt; but the life of this fuel supply is highly uncertain. And, moreover, who can say what possibilities lie before us in the line of electrical transmission of heat and power. The twentieth century is not yet four years old. Niagara and many of our interior rivers may offer great alternatives in the future location of industry. Nor is our list of localizing influences yet exhausted. A local *supply of capital* has been a powerful factor historically in the geographical development of industry. But the South and West have not only demonstrated their rehabilitation as fields for Eastern investment. They have also developed indigenous supplies of capital, big with possibilities for the future. The *supply of available labor* again has often determined territorial division of labor. To be sure, the English cotton industry settled in Lancashire because of its climate and in spite of its sparsity of population; yet it is labor supply, and that alone, which to-day gives our own South its hold on the world. Many highly specialized centers of industry, Gloversville, New York, for hardware; Brockton, Lynn, and Haverhill, Massachusetts, for foot-wear;

Attleboro, Massachusetts, with its gilded reputation for jewelry; Troy, New York, for its linen and laundry work; these and a score of other places owe much of their supremacy to their local supply of skilled labor. Yet the migratory habits of our American population show no signs of decline; and, moreover, the dangers of overcentralization in labor-unionism are inducing many manufacturers to long for a little more industrial seclusion. A noticeable decentralization of industry from the latter cause may be detected. And finally every improvement in the *technique of transportation,* making it almost as profitable to carry raw materials in bulk a thousand miles on a commodity rate as to transport the finished product even in carloads at high-class rates, helps along the same process.

Prices

Another important problem at this present time is involved in the relation of freight rates to general prices, as revealed by developments of the last four years in the United States. An almost continuous decline of freight charges characterizes the years since the close of the Civil War down to 1900. The extent of this decline is indicated very roughly by a fall in the average ton-mile revenue of the United States from 1.92 cents in 1867 to less than three-quarters of a cent (.729) in 1900; or to take Massachusetts by itself, from 3.11 cents in 1871 to 1.22 cents in 1902. So long and unvarying did this phenomenon appear that even traffic experts seem to have become convinced that the downward impulse was irresistible, only to be compensated for by increased efficiency in operation. Progress during these years certainly seemed to inure to the benefit of the public.

The prosperous years since 1900 have brought a sudden and remarkable change. Carriers combined, tonnage was

large, and commercial sentiment against departure from published rates was made enforceable by amendments of the Act to Regulate Commerce. The consequence has been a reversal of the downward tendency in freight charges. Rates have bounded upward, in fact, if not always on paper, to a degree more than commensurate with the general rise of prices characteristic of the time.

It is often difficult to prove these increases concretely. And it is often easy for astute traffic experts to show averages which minimize the real increases effected. The only way oftentimes to ascertain the amount of increase is by going directly to the individual shippers, asking them in fact what they used to pay and are now charged for identical service. The complexity of traffic methods defies statistical analysis. No general statement suffices; each rate must be worked out in detail. Thus for example in the case of grain rates from Chicago to New York, they were ostensibly raised from 17½ to 20 cents per hundred pounds, an increase of 12½ per cent. But only when it is made evident that owing to competition old rates actually paid were always from two to five cents below the quoted tariff of 17½ cents, whereas now the full 20 cents is exacted from all shippers, does the magnitude of a real advance amounting to 30 or 40 per cent become apparent. The stiffening of rates may be more indirect still. Rules of the Southern Railroad Association used to prescribe that for all cars over 42 feet in length a minimum weight of 28,000 pounds should be charged. In a particular case a shipper of wooden pails states that to load 20,000 pounds of his product, wooden pails, requires a longer car than this. Hence, if he be furnished one of these long cars and desires a car-load rating, he must pay a nominal rate per hundred pounds for 14 tons for every 10 tons actually shipped. Here is a real rate 40 per cent higher than it appears from the tariff.

Or, again to be specific: raising the minimum car-load weight of caustic soda or lye from 20,000 pounds, where it used to be in Official territory, to 24,000 and 30,000 pounds respectively, regardless of the difficulty of filling so large a car with these products, amounts practically to increasing the rates by 50 per cent without changing a type in the tariff sheets. And so, in a thousand little ways, abolishing privileges in demurrage, in switching charges formerly gratuitous, by stiffness in allowances for insurance, etc., the situation may be changed. This is what has happened a number of times during the last four years since January of 1900. The rates have universally been raised and together with these increases a multitude of other changes of the kind mentioned have all accentuated the same result.

The problem which we would raise is not as to the exact extent of this rise in transportation charges, but rather as to its significance in a well-ordered scheme of things economic. The old evil in this field was inequality between individuals. To combat that injustice was one of the main objects of the Act to Regulate Commerce in 1887. This inequality, particularly with the law as fortified by the Elkins Amendment, has now been more nearly obviated than ever before. The present problem is not of inequality, but of the general level of rates absolutely considered in its relation to prices as a whole. In other words, are carriers justified in expecting a sympathetic rise of rates in accordance with a general advance of commodity prices all along the line? We have for thirty years become used to a movement of railroad rates entirely independent of the course of prices, efficiency in operation being correlated with a reduced cost to the public. Are we to witness henceforth a reversal of this phenomenon, characterized, let us say, by a sliding scale of transportation charges following

the upward and downward trend of prices of things in general?

The problem must, however, be simplified somewhat further. All expenses of operation have greatly increased as a direct result of rises in wages and the cost of supplies. To be recouped for this final outlay, owners are of course entitled, although they have never heretofore been able to take advantage of any upward turn in cost of operation of this kind since the Civil War. And in so far as it is necessary to repay this added expense, no one will contest their justification for the raising of prices of their own product, —transportation. But the carriers have not alone been content to stop at this point. They seem to have based their claims for increased returns upon the necessity of continuing a high level of earnings and dividends reached at an early part of the period of prosperity. Many of them have in fact through consolidation capitalized the abnormal prosperity of two or three years. They established an unprecedented level of gross earnings from operation in 1900, of $1,500,000,000, as compared with an average of less than $1,200,000,000 for the ten years to 1899, an increase of more than 25 per cent.

It was frequently asserted in 1900 that this new high level of investment returns was henceforth to be maintained with net earnings and dividend rates commensurate with the increased gross receipts. Even this might be conceded could such results have followed at existing rates. No one denies their right to share in the general sunshine of good times. But the crux of the question is met when a decline in general business and prosperity gives rise to a claim, not only to all that they have already received, but also to a continuance of these high returns indefinitely. The means to this end lay close at hand. Having demonstrated their power to turn back the long-continued decline of rates upon

itself, they now proceeded to hold this high level of net earnings in the face of declining business by again raising the price of their product. That the enactment of the Elkins Amendment helped to make this possible, by prohibiting individual discrimination and departure from established rates, cannot be doubted. To be sure, the great coal-strike, with its largely enhanced cost of operation, followed by demands for high wages on the part of employees, would, without such increases in freight rates, have made a considerable cut in net earnings. This, together with a cessation of the increase, if not a positive decline in gross earnings, would undoubtedly have brought returns down with the general stagnation and fall of profits in other lines of business.

On the other hand, something was surely to be expected from the enormous outlays made during the fat years for permanent improvements. These ought to have helped to maintain net returns, even in time of stress. In this case both public and investors have been somewhat disappointed. Yet the character of many of these improvements, rightly considered, was not aimed primarily at a reduction of operation cost at all. This point seems to have been largely lost sight of. Many of them, improvement of terminals especially, will never have as much effect upon earnings as upon the monopoly control of the field. Every new station, every freight yard in large cities, every grade-crossing abolished, every tunnel completed, makes the possibility of effective competition more remote. The fact that railway returns have not yielded save inconsiderably until January, 1904, means the establishment of a new ratio for the country at large between transportation charges and the price of commodities, or at any rate it denotes an elasticity between the two which inures greatly to the advantage of the carriers at this time.

Who is to determine this question? At this present time more millions of dollars would be involved and more people affected than in any fifty cases ever argued before the Supreme Court of the United States. That one party to the issue shall at once be defendant, judge, jury, and court of appeal and last resort, is, in my humble judgment, a condition which an enlightened public opinion will not long tolerate.

Consolidation

A third transportation problem still in the making is that of railroad consolidation. A great movement began on the Eastern trunk lines in 1898, which culminated two years later in a wild outbreak of combinations of railways in all parts of the country. It was freely asserted that all of the carriers in the United States would ultimately fall into four or five groups, each holding a monopoly of a definite section of the country. In other words, that a division of the field similar to that which took place in France many years ago was the only logical outcome. These predictions confidently made three years ago are now being subjected to the test of experience, with the result that an ultimate solution along the lines expected seems much more remote than it did then.

The growth of giant consolidations has not ceased since the culmination of the furor in 1900. The Great Rock Island system, controlling over twelve thousand miles of line, has taken place since 1902. Of the first magnitude, this consolidation extends from Chicago to Denver, to the Mexican line, and into the very heart of the eastern Southern States. The Atlantic Coast Line Company, by purchasing a controlling interest in the Louisville and Nashville Railroad, forms a vast railway loop reaching from Chicago to the Gulf and away up round the Alleghenies

on the east to Richmond. The so-called Gould system has reached points on the Atlantic seaboard through control of the Wabash and of the Western Maryland. In fact the *coup* by which it broke the monopoly of the Pennsylvania, by entrance into Pittsburg, is one of the most interesting episodes in modern railway history. Another Eastern company ceased independent existence early in 1903 by the joint control of the Philadelphia & Reading by the Baltimore & Ohio and the Lake Shore companies. Inasmuch as these latter roads are controlled by the great Pennsylvania and New York Central systems, consolidation in trunk-line territory is appreciably advanced by this operation. More recently still a considerable system is presaged by the appearance of the Pére Marquette as an absorbing company. And finally, if rumor be true, the Chicago & Alton Railroad is passing at this present time into the great Union Pacific group.

Progress toward consolidation has not, however, been universal. A number of events are contributing toward an increasing independence of many companies. The adverse decision of the Supreme Court in the Northern Securities case in 1902 can scarcely be over-estimated in importance as affecting the nature of corporate development in this field. A most salutary check is thereby placed upon a malign tendency in the so-called field of high finance, although in this particular case the evils in sight were probably more than counterbalanced by the advantages to be gained. The dissolution of several voting trusts, notably the Erie and Reading, Ontario and Western, and Père Marquette, have thrown these important companies also more into the control of their owners. The Southern Railway is, in fact, the only important voting trust giving control to wholly banking interests, which remains from the period of reorganization of 1893. The dissolution of these

trusts may be, perhaps, taken as symptomatic of a general loosening of the hold of Wall Street upon railroads of the country. A large amount of so-called undigested securities, products of the reorganizations of 1893 and consolidations of 1900, were forced from banking control by the great liquidation of 1903. Huge operations conducted upon borrowed money were brought to an end by that wholesome event, so that it may be presumed that a number of railroads once definitely placed in groups named after prominent financiers are now to a far greater degree in the hands of their owners. Whether this increasing independence will render the properties more likely to be seized upon by growing consolidations remains to be seen.

Viewing the nature of the more recent consolidations and the disintegrating tendencies above mentioned, it appears less likely that a parceling out of our territory into monopolistic groups will be the ultimate outcome. Scarcely any of the great systems in reality can lay claim to an absolute monopoly of any considerable territory with the exception of New England, and if some substitute for the Northern Securities Company be found, the Northern transcontinental lines. Certain evidences appear that the process of merger cannot hope to obtain this result. All that a great system can hope for is that it shall connect the great strategic points of our vast territory. They all seek entrances into Chicago, whether their systems lie west, south, or southwest. Most of them aim at an outlet on the seacoast east or south. With this result they must be content. Moreover, the community-of-interest idea is working less smoothly than at the high tide of our industrial prosperity. Several events, such as the warfare between the Gould and Pennsylvania interests for entrance into Pittsburg, and the still more recent struggle between the Gould and Harriman forces concerning the Colorado

iron and steel products, cannot fail to be somewhat disquieting. And the supreme test of all, hard times, has not yet arisen. The old prediction may come true that present consolidations will merely transform railroad competition from a multitude of petty conflicts between small companies to titanic contests between consolidations in case of a sufficiently severe and prolonged period of depression.

But whatever the future of competition may bring forth, one thing seems clear. If the carriers are to get together for the advancement of their interests, it behooves the public to do the same. More and more is it being appreciated that ruinous warfare, be it of railroads or between labor and capital, shall not be permitted to jeopardize the welfare of the country at large. And the phenomenal development of consolidation which makes such warfare possible adds yet another forcible reason for the people to provide adequately for safeguarding the public weal through governmental supervision.

Governmental Regulation

It is often urged against a further extension of governmental regulation of transportation that the interests of the carrier and community are identical; in other words, that the interest of the road in charging what the traffic will bear is a safeguard for the public against charging what it will *not* bear. There are three objections to this statement, or, in other words, three reasons why the adjustment of freight rates under the present conditions of legally unrestricted private initiative are unsatisfactory.

These reasons, concisely stated, are: First, that the permanent interest of the carrier is often directly opposed to an adjustment favorable to the commercial or industrial welfare of the community served; second, that even if the permanent interests of the carrier and public are har-

monious, yet the *temporary* interest of the carriers may be at variance with a policy favorable to the public; and third, even if, as before, the permanent interests of the carrier and community are one, competitive forces may prevent the management of the railroad from doing what it concedes to be best and what it would do if its hands were free.

Let us illustrate these three possible cases by concrete illustrations:

The clearest instance of a permanent divergence between the interests of the carriers and the public is afforded by the great increase and maintenance of freight rates yielding abnormal returns to the carriers, to which reference has already been made. Let us agree that equality as between competing shippers may obviate any loss of those shippers due to an increase of freight rates; inasmuch as they all being raised at the same time simply shift the burden upon the community by raising the price of their commodity. But this very fact merely changes the contest of rights between the shipper and the road to a divergence of interest between the carrier and the consuming public. The case is so plain that it needs no further elaboration. Another illustration of the same divergence of interest is also often found in the establishment of a local industry in a new country. Suppose it is a question of establishing a new paper-mill at Denver, Colorado. The carriers serving Denver have enjoyed a remunerative traffic in the carriage of wood-pulp paper over a long haul from Wisconsin or elsewhere. The establishment of this paper-mill will mean the substitution of a short haul to and from Denver of wood pulp from Colorado, and of paper carried to a local market in the same state. Argue as you may that every industry added to Denver inures to the permanent interest of every carrier which serves that city, yet the fact remains that the loss of traffic is direct, while the ultimate

gain is indirect and will have to be shared with other roads serving the same territory. That this argument is a cogent one may be illustrated any number of times by the dog-in-the-manger policy which is too often taken by traffic managers.

Our second principle is that, conceding a joint permanent interest of carrier and public in a certain policy, the temporary welfare of the management may often be directly opposed to that of the community.

The best illustrations of this contingency are found in certain phases of speculative finance which, like the poor, are always with us. Of what use is it for the far-sighted traffic manager to seek permanent development of his territory if a gang of speculators are in control of the situation. What care they for the future growth of the territory at large. They may merely hold the control of that road for a few months in order to sell it out at a profit; or, perhaps, to secure profits by speculative manipulation vastly exceeding any legitimate earnings from operation. A huge volume of earnings must be made, let us say, to attain this result. Efficiency or safety does not count. Expenditures for permanent improvements are sidetracked and the country is practically exploited until such time as these speculative interests have accomplished their object by selling out to their rivals, or, perhaps, have been forced out of control of bankruptcy.

Results of the experience of the last ten years in the field of high finance emphasize the necessity of some adequate supervision by federal authority, not only of rate-making, but of financiering. This is perfectly evident. Such notorious episodes as the reorganization of the Chicago & Alton in 1899, by which its capital stock was watered four times over; the stock-market raid upon the Louisville & Nashville in 1903, by which its sale to the Atlantic Coast

Line was forced; and the entire process of financing of the Great Rock Island system,—all emphasize the need of reasonable control. It is useless to control rate-making so long as juggling with securities in this way is possible. In this respect, both investors and the public have a joint interest. Consider particularly the last case above mentioned, the financing of the Rock Island system, where less than $55,000,000 gives entire control of a holding company through its preferred stock, and thereby wields the entire destinies of a railroad system capitalized at over $500,000,000 and aggregating more than 15,000 miles of line. The commonwealth of Massachusetts did not hesitate many years ago to undertake the control of operations of this sort. That some way will be found for extension of federal power over this sphere is devoutly to be wished.

The third objection to the fixing of freight rates by purely private initiative lies in the rigidity of freight-rate adjustment as between competing carriers. This often makes it impossible for a road to do what it concedes to be in the public interest and what it would do if its hands were free. This case we may best illustrate by experience in the Southern States. Two systems of transportation compete for the carriage of cotton from the great Mississippi delta to the mills in New England. One of these operates east of the Allegheny mountains and the other west. The lines east of the Alleghenies desired some years ago to lower their rates on cotton from the Mississippi Valley to Carolina mills, inasmuch as the rate to those Carolina mills was in fact four cents a hundred pounds higher than the rate through the same territory away up to New England. Naturally the Southern cotton-mill men objected to this discrimination, yet it took repeated pressure to prevail upon the lines operating west of the Alleghenies to acquiesce in the change. A widespread and rigid adjustment had

grown up through years, many of whose arbitrary exactions would be endangered by modification. The Western lines would not permit the Eastern lines to make a change without exacting from these Eastern lines similar concessions for which they had struggled in vain. In other words, each competitor insisted upon jacking-up the other's rates regardless of the welfare of the community. Precisely an analogous case was found in 1880, when a committee of the Southern Railway and Steamship Association proposed to put in force an adjustment of rates throughout the South, having reference in some degree to the factor of distance. This proposed improvement was based, to take the words of the committee of traffic experts themselves, upon "necessity for more intelligent and defensible methods of making comparative freight rates than the following figures descending to us from tariffs named on arbitrary bases of conditions now obsolete." Such instances of opposition to reasonable adjustment, not by carriers serving a definite territory, but by competitors often far distant, might be multiplied indefinitely. They emphasize most certainly the need of a regulative force to be applied, not only in the interests of the public, but in the permanent interest of the carriers themselves.

The argument that the community is naturally protected against arbitrary exactions by the carrier, because any excessive charge will kill the traffic, rests, moreover, upon a false assumption in part. While freight rates may directly affect the volume of traffic, this is not true of most high-grade commodities.

The fourth objection which we have stated to freight rates as made without governmental supervision and control consists in the often infinitesimally small proportion of the total price which transportation forms. The rate on clothing from New York to Chicago by less than car-load

lot being, say, 75 cents per hundred pounds, a suit of clothes costs for freight perhaps from 7 to 10 cents. The transportation cost for a silk dress for a similar haul of 1000 miles might be possibly 2 or 3 cents. These charges cannot approximately affect the volume of traffic if increased even by a large percentage. And therefore not affecting the volume of traffic, the development of the territory served will not be affected, while a direct revenue to the carrier will materially result. We have said that the territory served will not be affected; that is not, of course, true, because in all probability the extra cost of carriage will be added to the price of the goods; but supposing the rates are similarly raised over the entire United States, no single community will be affected, but the general cost of living for the whole country will be raised. Practically a tax is laid upon the community by private initiative without any power of supervision or control.

Our final problem, then, involves the extension of governmental supervision at the hands of an administrative board or a properly constituted judicial tribunal. No domestic question before the country is of greater significance, involving as it does the welfare of practically every industrial and commercial establishment in the country as well as every individual consumer of goods. The matter is not settled by the enactment of the Elkins Amendment of 1903. That law was granted because it contained something that the carriers desired. The demand of the public for relief remains practically unanswered. Case after case before the Interstate Commerce Commission remains unsettled either because of the refusal of the carriers to conform to the decisions rendered, or because of prolonged and intolerable delay in the final adjudication by the courts. Other countries have never hesitated to embark upon great socialistic enterprises of popular ownership. In my judg-

ment the only way indefinitely to postpone an outcome of this sort, which is to be deprecated in many respects, is that a compromise in the line of more efficient control should be brought about.

THE MANUFACTURER AND THE DOMESTIC MARKET

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American Domestic Market

THE American domestic market is probably the most complex in the world. It has become so because it occupies the largest economically high-grade area which is under one political control, with a uniform language, system of weights and measures, trade customs, and laws. In America there have been lacking the diversified agriculture, the household industry, the public market-places, and the inertia of custom which, in other countries, have kept the domestic markets simple. Sharp territorial specialization has always characterized our industry. The different forms of agriculture, developed under an essentially manufacturing instinct and compelled to specialization by the distance of the European market, have a clearly differentiated geography. The mining, lumbering, agricultural, and manufacturing regions are singularly distinct. This has compelled an extensive internal exchange, to facilitate which adequate transportation facilities have been forthcoming; and it has necessitated comprehensive methods of performing mercantile functions, which the administrative genius

of America industrial leaders has provided. The result of these forces in our national economy, as it finds expression to-day in the organization and processes of the domestic market, is too large a subject for any paper.

I wish, therefore, to choose a theme, and I invite your attention to the wide range of mercantile functions which is being assumed by American manufacturing concerns and the unusual dominance they are acquiring in the domestic market.

Manufactures Forty Years Ago and To-Day

This movement, taken as a whole, is of recent origin. Before the Civil War manufacturers had very restricted control over the movements of internal commerce. There was no need for them to show special enterprise in securing supplies of raw materials, for the seller of the crude bounties of nature pursued the buyer. In the finished products market, articles imported from foreign countries controlled, and the autocrats of commerce, if there were any, were the great importers, the so-called "merchant princes." The home manufacturers started with the humble rôle of supplying the lower grade of products. Prejudice was still strong against home-made style goods and much of the product of American factories went on to the market anonymously or under misleading trade-marks to be sold as imported goods.

The change of forty years has greatly altered the position of the manufacturer in the distribution of mercantile power. In the majority of modern national economies we find the most progressive industrial group to be the manufactures; the least so, the extractive or raw material industries, while the mutually accommodative element is the mercantile. It is not difficult to mention some of the causes of the increased power of manufactures in this

country. Manufacture, including railroad transportation, since the internal economy of a railroad resembles a manufacturing rather than a mercantile concern, possesses the advantage of being that form of industry which best utilizes inanimate forces in a country where power is cheap, and best allows an accurate division of labor in a country where labor is expensive. It has enjoyed the special advantage in this country of a high general average of intelligence and an unusual mobility of labor. There has been the negative advantage of entire absence of prejudice against machinery and the positive advantage of the unusual mechanical ability which characterizes Americans. When we couple with this the protective tariff, which has insured a large and profitable market and made all other forms of industry pay tribute to manufacturing, it can be readily understood that our manufactures have resulted in recent years in an enormous production of wealth, a portion of which has sought investment in promising types of industrial enterprise under the direct control of the parent concerns.

Not only wealth, but capable men of constructive genius have been produced in this branch of industry. In manufacturing, the applications of science are so numerous and convincing as strongly to develop the scientific frame of mind. The striking combination of factors of production opens the thought to large plans. The changes constantly required in machinery and processes impel the manager to progressive policy, while visions of the economy of production on a large scale attract him. The manager is in a training-school for cultivating quick decision, figuring costs, managing men, freely laying out money where conditions justify, and grouping, combining, and governing the productive factors. The result is that in and through our American manufacturing industries have arisen the "cap-

tains of industry," who have laid hands upon the undeveloped or loosely coördinated commercial functions wherever found, and have developed them and assumed the direction of them.

Struggle for the Control of Raw Materials

To take up our specific topic and define the controlling position which the manufacturing industries have secured over the domestic market, it will be convenient to divide the subject into three parts, conforming to three classes of markets and the separate causes operating on each.

Let us first consider the struggle for the control of raw materials. For some time an effort has been made by manufacturers to more effectually control the source of supply of their raw materials. For those materials of which the quantity is relatively fixed, this has resulted from the definite development of sources of supply and the increase of manufacturing demand, carried to such a point that the chances of accommodation on the open market are deemed by business managers to be precarious. As a result, manufacturing concerns in many lines are anticipating their needs and are buying or have bought stocks of undeveloped materials, and are erecting exploitive works and establishments for preliminary manufacture. We find makers of soap and lard substitutes building cotton-seed oil-mills in the South. Pulp-mills invest in pulp-wood lands; fertilizer manufacturers open phosphate-rock quarries; oil-refineries lease and purchase oil-lands. The change is already complete for anthracite coal and Northern pine; it is just now being completed for Bessemer ore and Western timber; it is rapidly going on for coking-coal, non-Bessemer ores, and Southern pine. One of the striking signs of the advent of a new economic condition in this country is the rapid rate at which, during the last fifteen

or twenty years, raw materials have passed out of the hands of small holders who offered them upon open markets, into the hands of large corporations closely affiliated with manufacturing and transportation interests. To use an expressive phrase, there has been a scramble to prevent being frozen out. This has not been due so much to exhaustion of supplies as to the fear of their monopoly. It has, therefore, been immensely stimulated by the formation of great consolidated corporations and by the increased use of holding companies, stock syndicates, and harmony-of-interest arrangements.

With respect to raw materials which are readily reproducible, like wheat, cotton, and wool, the policy of our manufacturers is not to own and manage agricultural and other industries. But the tendency is increasingly shown to pass by the great primary or terminal markets and the visible supply of points on which raw materials were formerly secured, and purchase upon the remote local markets at which they first appear in commerce. There are several reasons to account for this.

In the first place, the imperfect and unorganized condition of many raw-material markets has forced it. The effort of our manufacturers to produce finer products, coupled with the increased value of materials and the closer specialization of processes, has compelled a sharper scrutiny of the supplies they purchase to secure purity and uniformity. The offering to manufacturers of poorly graded and mixed lots of materials has necessitated the substitution of professional for amateur local buyers, as in the case of wool. A poorly housed and protected product coming onto the market, water-soaked and stained, as often happens with our cotton, has favored direct shipments as opposed to the passage of materials through several markets with their delays. The agriculturist is with great difficulty able to

take initiative for the improvement of these conditions by commercial organization. As Professor L. H. Bailey has said, "The farmer reacts so slowly to changes in his environment that after all other businesses have become adjusted, he is still out of harmony with commercial conditions. Collective or coöperative movement among the agricultural classes is difficult, because of the lack of common interests. Farming is not one occupation, but many occupations." The American farmer has furthermore been engrossed in other things than the adjustment of markets. He has had laid upon his shoulders the great task of finding out the physical capabilities of a new country. Each region, climate, slope, and soil has required countless experiments to explore. A stupendous investment of labor and capital has been and is being made in these experiments, the results of which will be enjoyed to remote generations.

A second force drawing the manufacturer into the raw-material market is connected with the financing of the products of agriculture. The farmer is hampered by lack of ready money. The period of his turn-over is long; the fixed capital is large in proportion to the circulating. A considerable part of the spare money he has had has been attracted to investment in land. The statistics on unimproved land included in farms show that land is the chief storehouse of surplus agricultural wealth. Approximately one-half of the land included in American farms is unimproved. Under these conditions the farmer has sought money crops, and has been obliged to market as soon after production as possible. To secure adequate supplies of materials, therefore, some lines of manufacturing have been obliged to take direct part in the organization of a spot-cash market on which materials would always be sure of sale at fair prices. Such materials are then rendered good

money crops and hence attractive to short-handed farmers. An excellent illustration of the way in which this has been done by manufacturers is afforded by the various union stockyards of this country, in most of which the packing interests are prominent. The financial problem of accommodating the even requirements of a manufacturing plant for materials throughout the year to the necessity which the farmer feels of disposing of his crop at once when it is matured, has been solved through the coöperation of several agencies. The early purchases of manufacturers involve them in speculative risks. The profit or loss showing of a cotton or woolen mill or the milling profit of a flouring-mill often depends principally upon the correctness of the buyers' estimate of speculative conditions. There are also independent institutions illustrated by the grain elevator companies which aid in carrying speculative risks and controlling storage conditions. Furthermore, by the organization of produce exchanges it has been made easy for the general public, through speculative investments, to assume a considerable part of the financial burden of carrying foodstuffs and other materials through the year.

A third force drawing the manufacturer upon raw-material markets is railway competition. The result of intense competition for traffic has sometimes been that, in pursuance of a compact, a road has given substantial advantages to a large consumer when he has acquired the ownership of materials at the market of their origin, and is hence able to prevent their being diverted from the line at any competitive point, and insures their routing as desired. The transportation arrangement may include both the outgoing and incoming traffic of a concern in an agreement permitting manufacture in transit. Between a group of competing roads manufacturing interests have occasionally obtained advantages in return for acting as traffic-distribut-

ers. The classic case of this is in the early history of the Standard Oil Company. In these transportation struggles the manufacturer has been unable to keep aloof. The old-time free lance, the commission merchant, has been thrust aside; the raw-material producer has been confined increasingly to his local market; the manufacturer has taken up transportation worries and commercial functions unknown years ago.

Elimination of Intermediate Markets.

We now turn to a different type of buying and selling center, namely, that group of intermediate markets lying between different stages of manufacture and on which the finished product of one establishment is transferred to another to be further elaborated.

From the beginning of the factory system in America there have been fewer of these intermediate markets than in Europe. In the older countries the introducers of machinery found already in existence a strong household and shop manufacture, including the preparers of materials, those expert in the various intermediate processes, and the finishers. The factory system took possession of one process at a time, and thus independent concerns grew up, each engaged in but one stage of manufacture, and between these there continued to exist many of the intermediate markets. In America the projectors of the first factories usually found the entire field open and the products imported; consequently they were obliged to provide simultaneously for all stages of production. Hence we find, for example, as a characteristic difference between the American and European textile industry, that here the several processes of scouring and combing, or throwing and spinning, weaving and finishing are more often all controlled by one cotton, worsted, or silk concern than in Europe.

Just as it began to be realized that there were disadvantages in the American system, particularly in the adjustment of production to a rapid succession of styles, the trust movement made itself felt and stimulated the process of combination in all branches of industry. The organization of consolidated corporations has had many effects. It has made profits for the organizers through what Mr. Lawson calls "made dollars." It has given us a highly centralized type of business administration to experiment with. It has substituted a system of delegated authority for individual initiative. It has eliminated some competition, substituting therefor emulation and the comparison of records, and it has changed the form in which competition manifests itself. It has secured certain economies of production on a large scale. But among its various effects there is one which has not been sufficiently noticed, and that is the elimination of intermediate markets. Complex manufacturing corporations have been constructed involving not only former competitors, but businesses bound together in the sequence of production, capable of manipulating materials from their first appearance as economic goods until they are ready for the ultimate consumer, without at any time making them the object of purchase or sale. This linking together of processes in great corporations has coerced the independents to similar consolidation through the fear of the monopoly of raw materials, to which reference has already been made. The movement has been, in this manner, made general, with the result that many series of consecutive establishments can now be found which are working into one another's hands within non-competitive groups. The blast-furnaces have acquired ore properties, and steel manufacturers have in turn absorbed them and transportation facilities. Furniture factories have built saw-mills upon their own timber-lands. Cooperage-works

are owned by flour-mills and whisky-distilleries. Pulp-mills and their spruce-timber are owned by paper-mills. The meat-packers establish canning and car-works; the car-builders operate linen-factories; the reaper-works control the manufacture of binder-twine; the breweries engage in the production of malt. The combinations are made possible by the improvement in systems of cost-accounting and internal administrative methods. They give the supplying-plants certainty as to markets, the receiving-plants certainty as to supplies and absolute control over their quality. Shipments to and from intermediate markets are unnecessary, and the expenses of traveling salesmen, dealers, advertising, and the waiting period of the market are all eliminated. In short, for the uncertainty and expense of competition is substituted the economy and exact calculation of a system of bookkeeping.

Before leaving the subject a word should be said about an entirely different operating cause which is at work to withdraw many businesses from intermediate markets. This is the application of science to the utilization of wastes. The growth of large concerns has often made the quantity of mill-supplies and advertising materials, packages, etc., so great that subsidiary industries can be profitably started in the interest of a single corporation. Repairs also become important enough to warrant the erection of well-equipped shops. In a like manner the accumulation of large quantities of waste products in concerns of efficient management, equipped with scientific laboratories and possessing the capital necessary to put through any logical extension of the business, has given rise to a great variety of by-product manufactures. These allied businesses are owned and managed by the principal concerns and receive their materials without purchase from them. They have been able to offer very effective competition on the finished products market

and so to command attention to the commercial principles which they illustrate.

Approach of the Manufacturer to the Consumer.

Let us pass to the third main division of the subject and consider the attitude of the manufacturer toward the finished-product market. It may be observed that while there is a great difference in the policy pursued by large concerns, and we may find plate-glass jobbed, meat sold from subsidized shops, and Standard Oil hawked upon the streets, many of the consolidated corporations which have acquired large control over the market do not attempt to invade it directly or supplant dealers in the performance of mercantile functions. These rather content themselves with exercising power over prices and the terms of sale by curtailment agreements, price pools, joint selling agencies, and other more direct means. The greatest invasion of the mercantile field in the distribution and sale of consumers' goods occurs under the influence of strong competition between manufacturers and especially where this meets a more or less obstructive conservatism, not to say inefficiency, in the regularly constituted agencies of distribution. Of the positive force, the competition between manufacturers, it will not be necessary to say anything; of the negative condition found in the inertia of wholesale and retail trade a few words will be in place.

Confining our attention to the retail trade for the sake of brevity, we must at once make an important admission. In this field there has sprung up the remarkable institution known as the department store. These establishments, dealing directly with manufacturers, willing to engage in want-creation and increase the volume of business by advertising and price reduction, willing to accept new goods of merit because understanding the profit of novelties, and

having a clear grasp of the principles of merchandising, have not only been able to serve the consuming public well, but have been satisfactory distributive agents for manufacturers. The rank and file of the million or more proprietors of retail stores have, however, been unsatisfactory to such manufacturers as have been chafing for better outlets under the stress of competition. The average retail store proprietor has too easily accepted as unsurmountable the apparent limitation of his local field, and has often been caught in the infinite detail which characterizes the business and rendered by it incapable of constructive commercial policy. Competition has choked many who are lacking in ingenuity, for retailing is a business easily entered on a small scale, and competition in it, almost more than in any other type of business, takes the form of simple multiplication of concerns and division of trade. More than anything else, however, the business of retailing as a whole, has been held back by confusion of mind as to the proper policy—the economic laws so to speak—of the business. This confusion may be partly accounted for by the extreme variety of establishments which fall under the general caption of retail institutions, but the chief explanation lies in the recent history of American trade.

During the period of the Civil War and the immediately subsequent years there was such a scarcity of goods that overbuying was almost impossible and the check upon buying, always so essential in normal retail trade, did not seem so necessary. For a long period prices rose with such rapidity that the profits of a rapid turn-over of capital paled beside the estimated profit of appreciating stocks lying on the shelves. Under these conditions it was natural that the merchant should treat his customers with indifference. The fluctuation of values made price publicity and a policy of fixed price impossible. Dickering and bargaining became a

natural accompaniment of all important sales of goods. In the settlement of accounts long credits were not found to be very dangerous. Recent years have reversed all of these conditions, and hence have demanded an entire reversal of policy. The generation which did business in the previous period has been put at sea, and there has been established a confusion of principles penetrated until the last few years only by a few of the stronger minds. The result has been to cramp the growth of the retail industries as a whole and render them unsatisfactory to the manufacturers as the distributors of their products.

The invasion of the realm of the retailer has been made by the manufacturer in several ways; by establishing a mail-order trade and eliminating dealers entirely; by distributing through the dealer, but absorbing many of his functions and controlling his actions; and finally by the ownership of retail establishments.

Direct Selling

When a manufacturer has been met with unwillingness on the part of the dealer to educate new wants in the public and a refusal to stock and introduce new goods, he sometimes appeals directly to the consuming public. Direct selling has always had a considerable field. Natural monopolies of necessity use it. Producers' goods such as leather, billet-steel, and boilers, are usually sold in this manner. Neighborhood manufactures, such as custom mills, and manufacturing retailers, such as bakers and tailors, use it. The country at large is familiar with the canvasser. As important as some of these lines of distribution are, the great modern development of direct selling has come with the perfecting of its chief instrument, advertising. So great is the progress made in the arts of publicity that the entire complexion of trade has been

changed by it. Advertising is often spoken of as a science. It is certainly a complex and powerful engine. The development of the arts associated with it, that is, printing, and especially illustration, has increased its potency. The vehicles which convey it to the public are numerous. The weekly newspaper is largely supported by it. The low-priced magazine of our day exists because of it. Through it house organs are built up scarcely distinguishable from independent scientific and trade publications. It counts in its service the billboard, the dodger, the sample, the catalogue of encyclopedic proportions, the commercial package, and the follow-up system. Its technique has been carefully considered, and the statistical study of circulations has been made the basis of a profession. Even its psychology is being explored in college laboratories. There is no need to enlarge on the extent to which advertising has been applied by manufacturers to direct selling. The examination of any popular magazine will be convincing. As a method of distribution this affords a manufacturer an outlet independent of the will of any dealer. It serves well to introduce new articles, and trade built up by it can be used as a means to bring pressure to bear upon dealers.

Control of the Dealer

It is not always, however, in attacking the market that a manufacturer is willing to cut loose entirely from the established retail distributive agencies. Many articles cannot be readily sold by mail-order. A way has, therefore, been discovered by which the manufacturer can distribute his goods through the dealers and still so control every important part of the distributive process that the dealer is reduced almost to the condition of an automaton. When he is in complete command of his entire field the retailer is perhaps the most universal servant of industrial society.

His functions are both varied and intricate, blending a mechanical element with the art of personal service; controlling a flow of goods involving endless detail by a system the correct formulation of which is a masterpiece of commercial statesmanship. The task of the retailer is to furnish the consumer goods wanted, at the time and in the quantity and place desired. He chooses his stock from the infinite variety of manufactured articles. He educates the customer to new wants, making known to him new goods and showing their use. He advises with him in his purchases, that the adjustment of the want, the goods, and the pocket-book may be as perfect as possible. He makes the buying process easy and agreeable for his customers. He protects his merchandise from deterioration. He guarantees it to be as represented, putting his reputation behind it. He measures it out in quantities convenient for the customer, puts a fair price upon it, and delivers it.

Now consider how many of these services can be rendered by a manufacturer. Take the case of the sale of a spool of photographic films. The manufacturer puts the article in a form ready for immediate use. He furnishes a package which protects the goods and shows the size, quantity, and age, besides carrying a guarantee and serving as a memorandum of exposures and a cover for mailing. A pamphlet of instructions is given away by the manufacturer, who advertises extensively to attract trade. The price is fixed and is everywhere the same. If you look for the goods in a strange city you will probably be guided by a sign furnished to the dealer by the maker and you will be attracted by large photographs, from the same source, to show the range of work possible. As the films must be developed, the company offers to do this, but it also puts on the market a simple apparatus and all the necessary chemicals. The value of films depends largely upon the

possibility of obtaining them in travel; consequently the makers have established agencies in almost every important locality in the world. In the solution of this distributive problem, which was unusually complex and difficult, the manufacturer has originated all the plans, done all the work, and controls all the essential conditions. The most ignorant clerk, can quickly learn all that remains to the retailer to be done.

The inventive genius and advertising talent shown by leading American manufacturers in putting their goods upon the market are certainly remarkable. By advertising, with the powerful individualizing agency of the trade-mark, by sample distribution, by demonstrations at the consumer's house or the merchant's place of business, by exhibits at universal expositions, such as can be seen in endless numbers and variety upon these grounds, the manufacturer educates new wants in the customer and makes known new goods. By explicit printed directions, in several languages perhaps, and accompanied by ingenious pictures, he so clearly shows the use of the goods that the advice of the dealer is rendered unnecessary to a person of any intelligence. By the use of a package, perhaps air-tight or moisture-proof, the dealer loses all credit for keeping goods in presentable condition. As the customer knows, when he opens the package, that it was closed at the factory, he feels that responsibility for its quality is removed from the dealer; and when with the package there is a strong and carefully emphasized guarantee, the dealer sinks into a mere agent for the transfer of any complaints to headquarters. Personal relations of customer with dealer are in this way weakened, and the more so since the customer realizes that in any store where this article with its identifying trade-mark can be had, an absolutely identical ware is found. The package furthermore does

away with the necessity of weighing or measuring, and it usually carries prominently marked upon it a price which sets a maximum upon the charges of the dealer.

This incursion of the manufacturer into the province of the dealer has been disadvantageous to the latter in several ways. In the first place it has reduced the portion of the profit which the manufacturer leaves to the dealer, for with every function which the manufacturer takes up he makes a corresponding reduction in the profits allowed the retailer. Again, it sharpens the competition of dealers in the same line. The use of packages and trade-marks has, in a few years, vastly increased the list of goods which can be recognized by customers as identical in different establishments. The significance of this lies in the use of leaders and other forms of price competition. A leader, in retail trade, is a line of goods put on sale at a very low price to attract the attention of the public and impress upon it the idea that the establishment in question has very low prices in general. There is no direct profit in leaders to the trade, since they must be sold at or near cost. Now those articles serve best as leaders which can be identified by customers as absolutely the same in different establishments, because this identity gives force to the price difference. If there were not identity the customer and the higher-priced dealer could easily claim that the difference in quality accounted for the difference in price. Consequently the widely advertised goods which carry trade-marks everywhere known and which are bought by most dealers, all of them serve more or less as leaders. That is to say many of them do not yield satisfactory profits, unless specially protected, because of the directness of the competition of dealers with respect to them. The manufacturers have also created a new form of competition between dealers in different lines of trade. The majority of

retailers have handled a restricted group of merchandise, as drugs, shoes, hardware, or dry goods. There are many articles which cannot well be sold by one not expert in the business. The druggist could probably not explain the operation of certain tools; the dry goods merchant would be dangerous as a compounder of prescriptions. Within certain limits, therefore, stores in different lines have not competed directly. There has always been, however, a class of goods so easy to sell that they have been carried by dealers of all sorts as side lines. The manufacturers have succeeded so well in rendering simple the retailing of many of their wares that they have vastly increased the list of articles which any dealer, regardless of his line, can sell. The consequence is that dealers of all types are introducing side lines taken from each other's field of trade. Reprisals are everywhere made, and so the number of competitors with whom each dealer has to reckon is increased. The manufacturer, by direct selling to large retailers, whether they be department stores or mail-order houses, has put the small dealer, who depends upon the jobber, under a great disadvantage. This compels the jobber and semi-jobber, with the various classes of syndicate buyers, to take part in the confused competitive strife now prevailing in the distributive trades.

In this struggle, for which the manufacturers are largely responsible, it is interesting to see that appeals for help are made to them by the dealers. These appeals, through trade associations and otherwise, take the form of requests that the manufacturers should control the retail price at which their goods are sold, and in so doing protect and regulate the profit which the dealer is to receive. There has been considerable response to these appeals, since the manufacturer has a direct interest in the soundness and profitableness of the business engaged in distributing his products.

From this has resulted a variety of plans by which the manufacturer can regulate retail prices and profits. One method is through the establishment of Exclusive Agencies. By this I do not mean the practice of giving an extra cash discount to dealers who handle no rival goods, a practice pursued by some concerns which are trying to perfect a monopoly, but I refer to the plan of choosing a dealer as agent in each market and making it impossible for his near-by competitors to secure the goods in question. The retail exclusive agency is the application of an arrangement long common between manufacturers and jobbers. The manufacturer regulates the price at which the goods are sold, and, since the outlets are restricted in number, keeps up an aggressive advertising campaign to drive trade to them. Some articles sold in this way are tools, men's linen, dress-patterns, shoes, and silks. The exclusive agency prevents goods from being made common upon the market as leaders, and this pleases a certain exclusive element of the buying public. Its chief service, however, is to limit competition by providing one dealer only with the goods on each market.

A second way of regulating retail profits is by means of a Price Contract. This involves an agreement regulating the selling prices and signed by manufacturers, jobbers, and retailers. Such agreements have been freely used in the sale of patent medicines under the name of the "N. A. R. D. Plan," named from the National Association of Retail Druggists. When there is printed upon the goods or their labels directions as to retail price and terms of sale, and these are worded to form a contract with any dealer who may purchase the goods, the arrangement is known as the "Worcester Plan." In the attempt to enforce these contracts by law different interpretations have been encountered in various courts. In Massachusetts the Su-

preme Court has held that the fixing of the price of proprietary medicines is not contrary to public policy and that as between the manufacturer and dealer the acceptance of goods as billed makes the printed contract on their labels regulating distribution binding on the dealer as a part of the contract of purchase. In Rhode Island and Pennsylvania it has been held that the mere purchase or acceptance of goods by a dealer without specific assent to a contract printed on them does not bind him. Price contracts have been used freely in the sale of patent medicines, books, and in the case of at least one celebrated brand of soap.

A third means of regulating prices, known as the Factor or Rebate Plan, is more elastic than the price contract. It has been used chiefly between manufacturers and wholesalers, but is equally applicable to retailers. According to this arrangement, after the proper contracts have been made in writing, a manufacturer sells to a dealer at a certain open price, giving the usual rebates for cash. It is agreed that the dealer shall sell at a given price, and the difference between this and the manufacturer's price involves a small but unsatisfactory profit for the dealer. At the end of a given period, say six months, the dealer makes an affidavit to the manufacturer that he has not sold his goods at less than the mentioned price; thereupon the manufacturer pays to him a per cent of the original purchase price in the form of an extra discount which, added to the direct profits of sale, makes the transaction remunerative to the dealer. The contract establishing these relations is so devised as to take the form of creating the relation of principal and agent between the manufacturer and dealer. The dealer is not bound to sell at a given price, but he is paid a bonus when he does so. The rebate plan has been most prominently applied in the sale of sugar. The so-called Whisky Trust at one time used it. It is now used

in a number of the lines handled by grocers, such as soap and baking-powder. The Pittsburg Plate-Glass Company employs it.

Probably the most effective of the means now in use for regulating retail prices is called the Serial Numbering Plan. As used by a prominent manufacturer of medical preparations the plan involves, first, an exclusive system of distribution. Only authorized wholesale houses handle the goods, and they are under contract to sell only to the retail agents of the company. Every retail dealer, before he can purchase the goods, must sign a contract by which he becomes an agent of the manufacturer and agrees not to sell the medicines to any other dealer who is not an agent at any price whatever, and to sell to others only at the authorized retail price. Second, the system provides a means of keeping track of goods. Each dozen of bottles sent to the wholesaler bears a certain consecutive number, and with it is a postal card having stamped upon it the same number. When the goods are sold by the wholesaler he sends the card to the manufacturer with the name and address of the dealer to whom sold and the date. The retailer must not sell or otherwise dispose of a bottle until his firm name has been plainly written or printed across the face of each wrapper. By this means if a bottle of the preparation is anywhere sold at less than regular prices and the manufacturer can ascertain the serial number, he can trace out the responsible agent. The latter, on proof of price-cutting, becomes liable to the company for specified liquidated damages.

Ownership of Retail Establishments

We turn finally to the last of the methods by which the manufacturer is making his power felt upon the finished-products market. This is by the direct ownership and op-

eration of retail establishments. As a method of distribution this innovation is as little subversive of the usual equilibrium of trade as any irregular method. Each establishment takes its place simply as one among other competitors.

Let us consider the actuating motives as they present themselves to various classes of manufacturers. Take, for example, the sewing-machine makers. In the sale of certain kinds of goods a somewhat elaborate demonstration is necessary, and after sale, occasional repairs, both of which require the presence of an expert more skilled than the average storekeeper. Experience shows that the experts are best chosen, trained, and superintended as direct agents of the manufacturer. When sales made in this way are of sufficient density to warrant the permanent location of an agent in a neighborhood, and when the articles are sufficiently attractive to make the opening of a public place of business with a stock-room worth while, the system of traveling agents gives place to permanently located retail agencies. The firm controlling the largest number of retail agencies in this country is probably the Singer Company, which has eight hundred stores in the United States, besides many in other parts of the world. Automobiles, safes, phonographs, and typewriters are sold in part by this system.

The case presented by the sale of carriages, wagons, plows, and agricultural implements generally is very similar to the above. Here an added motive for the direct control of retail agencies lies in the economy of shipment by car-lots. An agency, because it pushes the make for which it was established and carries a full line of the goods, is able to take a larger proportion of its supplies from the factory in car-lots than the average independent dealer. If, therefore, the goods to be distributed are very bulky, so that

the question of car-lots is important, the establishment of a few agencies in the chief markets may be profitable because they will be able, through their own sales, to take goods in car-lots, and they will also serve as transfer-houses in distributing supplies to smaller markets. If numerous agencies are desired to penetrate and hold a field, the expense may be lessened by selling the goods of other makers on commission. If the establishing concern makes plows, its agencies can add on and sell goods germane to a plow agency, such as reapers, wagons, and carriages. By selling on commission, car-lots of assorted goods can be frequently sent out, keeping the stock fresh without overloading the agencies.

The direct retailing of shoes presents an entirely different case from that of agricultural implements. The general buying public has recently become familiar with retail establishments owned by manufacturers and which are stores in the usual meaning of the term. They are not as yet very numerous, and their establishment is not stimulated by any of the advantages which we have just considered. They are not practicable except for goods which can be successfully sold by themselves in specialty stores (that is, they are impossible for articles like sugar or saws), and in this fact of depending upon specialty sale they meet their strongest check, for the prevailing tendency which has originated among retailers is integrating in its nature and is expressed in the department store. Furthermore, a system of retail stores operated by a manufacturer cuts him off from distribution through independent dealers, for the dealer will not buy of his rival in trade. There are arguments, however, which have apparently been deemed convincing to many manufacturers. A chain of stores absorbing the output of a factory affords an independent outlet entirely free from the control of jobber or retail dealer.

The maker also, by coming into direct contact with the customer through his agencies, has the benefit of the direct criticism of the user. He can from week to week follow the changes in demand as they affect styles. He can to some degree avoid the intensity of rush seasons and the idleness of dull ones in his factory by supplying his stores evenly throughout the season. The dominant argument in most cases is, however, undoubtedly the fact that it is only through the ownership of retail stores that the full profit of an extensive advertising campaign can be realized by the manufacturer. By means of retail stores he takes all of the highest retail price which the force of his advertising will induce the customers to pay. The stores themselves also are an advertisement. The independent dealer always wants his own name over the door. The manufacturer's store exerts its entire force as an harmonious element in the general scheme of publicity which is being followed. This principle, which makes the store one means of realizing the profit out of the modern gigantic campaigns of advertising, helps to account for the shoe-stores of Douglas and Means, the forty-five of Bliss & Co., and the twelve Crawford Shoe stores. It applies to the Knox Hat stores. Together with the desire to intrench a monopoly, it explains the policy of the American Tobacco Company in effecting distribution through the United Cigar-Stores Company and other firms.

It is worthy of notice that there is a tendency at work which in the near future may lead to an increase in the number of stores owned by manufacturers or combinations of them. This is connected with the growth of advertising. When a few manufacturers only are conducting strong advertising campaigns they are conspicuous because they are the exception. When a large number of competitors besiege the public, the conspicuousness of any one is lessened by the eagerness of all. We have, in this coun-

try, in a generation been introduced into an age of advertising. The very great advertisers are yet conspicuous because they are not numerous. But when the time comes, as it appears to be coming rapidly, that the multitude of great advertisers in any single line is so large that the average consumer is bewildered, then the retailer may again perform the service he once performed; he will choose for the customer, and the customer will follow his advice. Under such circumstances, unless monopoly or some other combination of factors intervenes, the manufacturer will feel a strong motive to control directly retail establishments and so get a step closer to the consuming public than advertising will bring him, and, if possible, distance his rivals.

Conclusion

In conclusion, let me recall briefly the chief points in the situation I have tried to picture, which is one phase of our evolution from a raw-material producing to a manufacturing nation. Because of its natural strength as a form of industry, and because of special advantages accorded it in this country, manufacturing has in recent years greatly increased its dominance in domestic commerce. In the raw-material market this is shown first by the increased ownership of materials of fixed quantity, stimulated by the fear of monopoly and the trust movement. Second, for materials easily reproducible, it is shown by the advent of the manufacturer on the market of origin, and the causes which have brought him there are the unsatisfactory condition of materials offered, the necessity of taking part in financing the movement of raw materials, and railway competition. The intermediate markets, we have seen, are being depleted by the withdrawal of manufacturing concerns from them, which either became parts of non-competitive groups during the period of trust formation, or have become attached

to other industries as by-product or waste-utilizing manufacturers. On the finished product market the dealer has been eliminated from some lines of distribution by direct selling, which advertising has made possible, or by the ownership of retail stores, the function of which is to secure to the advertiser all of the profit his advertising will create. In other lines of distribution the retail dealer has been deprived of many of his functions by the use of packages, trade-marks, guarantees, printed directions, and advertising. This has resulted in a smaller margin of profit for the dealer and sharper competition because of the increase of leader goods and side lines. In his extremity the dealer has besought the protection of the manufacturer, and the latter, in many lines of trade, now dictates the retail profit and protects it by exclusive agencies, price contracts, and the factor and serial numbering plans.

I have no wish to over-emphasize the tendencies I have presented. Many of them are not as yet prevailing tendencies, but if all of them taken collectively establish the fact that manufacturing in this country is assuming mercantile functions, it is a subject worthy of serious study. It involves the internal economy of businesses, because up to this time it has been an axiom of trade that it is dangerous for a business man or a corporation to undertake two kinds of business the fundamental principles of which are entirely distinct. It involves also larger considerations of the national economy, because the three great categories of industry, raw material, production or agriculture, manufacture, and trade, have, in the period previous to this, been distinct, and a change in the domestic market more fundamental than the coalescence of two of these or the dominance of one by the other would be hard to imagine.

FOREIGN MARKETS

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PART I

A Review of Recent Developments in that Part of Economic Theory which relates to Foreign Markets

THAT part of the theory of political economy which relates to foreign markets—the theory of international trade and the theory of foreign exchanges—has had, of late years, an appearance of finality which has been conspicuously absent from some other parts of economic science. This stability has endured while the theory of distribution —the rational explanation of rent, interest, and wages— has been a sea of raging storms; it has endured while the theory of value, which Mill regarded as so nearly perfect, even in his day, has been subjected to extensive revisions, in phraseology if not in substance; and while even the theory of prices, so much more nearly related to that of international markets, has been subjected to attack. During all this time, through all this turmoil, the theory of international trade, as set forth by Mill, and that of foreign

exchanges, as expounded by Goschen, have remained well-nigh unaltered and little criticised. A review of the latest text-books and treatises shows us the same old theories, unchanged save in some slight details. For the present, therefore, we may assume that the theory of these two subjects is fairly satisfactory to economists as serving their purposes and explaining the more important features of foreign trade.

Although the generally accepted theory of international trade is in the main the same as it was fifty years ago, there is a tendency among recent writers to make a change in emphasis. The theory of comparative cost, or relative advantage, as the element chiefly determining the direction of trade, is so striking that it is apt to receive more emphasis and to be given seemingly a more important place than it really deserves. It is, of course, true that relative advantage, entirely irrespective of absolute advantage, may, and in many cases does, determine what goods a nation will produce for export and what it will prefer to import. But by far the larger part of foreign trade moves along the lines of absolute advantage, combined as that is, necessarily, with relative advantage. Our largest exports are of those products in which we have an absolute advantage over all but a few sections of the world, and our largest imports of those things we can scarcely produce at all. It is probable that the theory of comparative cost received undue attention mainly because it is not obvious at first reading and requires careful expounding and elaborate illustrations for its demonstration. But that absolute advantage rules wherever it occurs has always been recognized.

The conflict between free trade and protection still continues with unabated vigor, protection seeming to gain ground in practice. But the chief features of this conflict

are political, as they ever have been, rather than economic, and the conditions have not been such as to call forth any new arguments. The proposals of Mr. Chamberlain and his party in England, and the possibility of tariff reform in the United States, will be discussed in their practical aspects in the last part of this paper. There are then no real changes to note in the theory of international trade.

The theory of foreign exchanges or international payments has also, as has been said, remained essentially unchanged, but there has been a notable attack made upon that part of the theory which explains the international movement of money or bullion. The older theory was that whenever an excess of bullion accumulates in any country (or locality, for in this respect national boundaries present no barriers) from any cause whatsoever, it tends to raise prices and that country (or locality) becomes a good place to sell in and a poor place to buy in, and thus the excess is drawn off. This involves the acceptance of the quantity theory of money. Those writers who have abandoned the quantity theory of money have found themselves compelled to criticise this theory of the international movement of money. Their criticism has been supported by two lines of argument. The first is that international prices are fixed by telegraph and other means of rapid communication and cannot differ from country to country even for a short time. They further allege that there is no statistical evidence, when money moves from one country to another, of such changes in the price level as are required by the old theory.

In all of this it appears to me these writers overlook the influence of the discount rates in bringing about virtual changes in prices and, above all, the fact that the rates of exchange are fluctuating constantly. A change in the rate at which a man sells his bill is tantamount to a change in

the prices he receives for his goods. The machinery by which foreign trade is governed is so delicate that a very slight change will set it in motion. Those who criticise the older theory make much of the argument that a uniform "general" rise or fall in prices is never observable, as the prices of some commodities fall when others rise. I am inclined to believe that a "general" rise can and does occur. A change in the discount rates and a change in the rate of exchange is tantamount to a general change in the level of prices; as it affects all bills alike, it affects all sales alike. It is the resultant of those forces which affect all prices uniformly, other forces being at work on the different commodities separately, causing the divergences which have obscured the issue. Such a change in the rates of exchange is the very phenomenon demanded by the old theory as the cause of the international movement of money. The old theory does not require that merchants get out new catalogues or change violently from what would otherwise have been the bids they make or accept on the exchanges. A sale of wheat by a Chicago shipper to London on a day when he can sell his bill at $4.89 is worth one per cent more than if the sale took place on a day when exchange is $4.84. Here we have a difference of one per cent which can occur without a single change in quotations. Every such fluctuation is felt at once by the delicate machinery that moves the tides in the ebb and flow of bullion in international payments. As to the argument that we have no evidence in current index numbers, showing clearly that a rise in prices has followed an increase in the stock of bullion, it may be said that we have no statistical device for watching prices which will record such a change with the requisite delicacy, even if we were warranted in looking for the change in the prices current. The change required by the theory is too slight to be de-

tected by any statistical device yet invented. Such a criticism amounts to saying that the governor of a steam engine does not regulate its speed unless the arms and balls are gyrating violently up and down, when, as a matter of fact, the better the governor, the slighter the fluctuations. The weight of the argument in this controversy that has recently grown so hot seems to me to sustain those who have rushed to the defense of the quantity theory, and there seems to be no occasion to qualify the statement made above that the theory of foreign exchanges has undergone no important modification in recent times.

Part II

A Review of Some of the More Important Recent Events in the Economic History of Foreign Markets

Although the economic theories relating to foreign markets have been quiescent enough of late, there has been stir and bustle indeed in the markets themselves, and during the past five years certain great changes affecting them have come to pass which are worthy of enumeration and which suggest many important problems and considerations. These changes affect primarily the markets for American and also for European goods in the Orient and the routes of travel between the Far East and the markets for Oriental wares. They are: (1) The acquisition of a trading-base in the Orient by the United States; (2) the completion of the Trans-Siberian Railroad; (3) the expansion of steam-carrying trade on the Pacific and the definite determination of the fate of the Panama Canal; (4) the opening of China; (5) certain important changes in the conditions of the production of several of the great commodities of the world's trade.

Section 1

The Acquisition of a Trading-Base in the Orient by the United States

Chief, in many respects, among these changes is the advent of the United States in the Orient by the acquisition of the Philippines, of Hawaii, and of other islands in the Pacific. That this is an event of first-rate importance is easily realized when we consider but for a moment the significance of the Philippines in the past history of Oriental trade. Manila has been in the past, and can again become, a great commercial emporium. In 1573, when the Spanish acquired Manila, there was no safe and economical route from Eastern Europe to the Orient. Long and tedious as was the Spanish route by galleons to Acapulco, across Mexico, and then across the Atlantic, it was far less difficult than the older routes via Archangel or Northern Russia and Central Asia. Moreover, Manila was, by virtue of its location and of the local products of its immediate environment, a natural emporium for the collection of some of the most precious wares then or since known to commerce. Conveniently located between China and the Spice Islands, with India also near at hand, Manila had the additional advantage of being a collecting and distributing point for certain local wares which had, long before the advent of the Spaniard, served as a lure to bring the Chinese and other Asiatic traders to her harbor, and which in turn helped to obtain the wares that Europeans sought. With silver from Mexico, and by way of enforced "tribute," the Spaniard bought or collected from the natives of the Philippines, rice, palm-oil, abaca and other fibers, fine straws and cane, dye-woods and lumber needed in China, and bartered these for the silks of China, the fine woven

fabrics of India, and the spices from the islands to the southwest of the Philippines, which the Chinese traders brought.

As a mere dépôt for southern Asiatic wares Manila has since lost her original monopoly, and must now compete with Singapore and Bangkok, and what is more important than either or both of these, with the aggregate storage capacity of the many smaller treaty ports south of Shanghai and the ports in French China. Her nearest European rival, Hongkong, she need not fear, for Hongkong has no warehouses and no local products, and is commercially but a city of office buildings. Her vast shipping trade is a mere paper record of tonnage passing by but rarely discharged. Hongkong, moreover, is at a point slightly off the direct route of the most important lines of trade; Manila at a point where many lines of sail and steam travel naturally converge or pass, and directly on the main route from northern Asia to Australia. Imports into the Philippines via Hongkong dwindled from $4,600,000 in 1900 to $500,000 in 1903 under the influence of direct steamer connection with northern Asiatic ports. A day for a ship in Hongkong Harbor waiting for orders usually means a day lost in idleness of men and capital, an item of necessary expense, perhaps, but with nothing directly to offset it on the profit side of the account nevertheless; while a day in Manila Bay, by contrast, is one of busy activity and with a distinct profit to offset expense. With rice and cotton goods inbound, abaca, copra, and sugar outbound, Manila has business for a steady stream of vessels; and as a collecting-point for spices, for Chinese table delicacies, such as *bêche de mer* and birds' nests, and for shell and similar valuable items all northbound, she has no rival save Singapore, and, although for silk, coffee, and spices westbound she has to compete at some disadvantage with Singapore and Bang-

kok, she has no rival when the same wares are eastbound. Tea is the only great staple of Oriental export in which Manila cannot deal with advantage.

It is obvious that Manila can again be made a very great emporium, and whatever tendency there may be under the flag to turn these valuable wares which can be assembled there over an eastbound instead of a westbound route tends to increase its importance. In this respect it is a great pity that the exigencies of the revenue system have not allowed the United States Government to make Manila a free port like Singapore. To be sure, the methods of modern trade do not demand, to the same extent as in the past, the gathering of wares by small ships at great ports to be finally transported to their destination in larger vessels. The large steamers of to-day have so many ports of call that the territory contributing to any one dépôt is limited. But Manila is so situated that the territory naturally tributary to her is large. The *entrepôt* business of Manila at the present time is limited to products of the Philippines, and though large, is but a small fraction of what it should be. The existence of a custom-house, with the necessary inspection, delay, tonnage-duties, port-charges, etc., even though duties are remitted on goods intended for re-exportation, involves such a burden that a port so afflicted cannot become a collecting center, save for goods produced within the tariff wall. To afford Manila a chance to rehabilitate herself as an emporium for the Orient, a portion of the port and harbor might be set aside as free territory. There are islands in the harbor which would serve this purpose admirably. Within this free territory goods not the products of the Philippines themselves and not destined for importation into the Philippines could be landed, transshipped, etc., and vessels come and go free of restraint. As there is no hope that the custom-houses can be abolished

in the islands for years to come, because of the need of revenue, some such plan is necessary to restore Manila to her proper place in Oriental trade.

The importance of Manila in Oriental trade may be illustrated in another way than by the mere enumeration of her advantages of location and the importance of the local products of her contiguous territory. The fact that the Mexican dollar is the standard coin, so far as there is any standard, in the greater part of Oriental trade, shows the extent of Manila's former commercial supremacy. For two centuries a steady stream of these coins flowed through Manila at the rate of from 250,000 to 3,000,000 Mexican dollars per annum into her commercial connections. The extent of their dispersion measures very nearly the extent of Manila's commercial influence. That the United States, the only great Occidental nation still using the dollar, should have entered the Orient over the pathway marked out by that coin, is at least auspicious.

Manila's commerce has responded rapidly to the advantages of American rule. During the first three years of our administration it grew to double that of the best year under Spanish rule, and has grown apace ever since in face of war, with its devastation, pestilence, and terrible agricultural reverses, and in spite of a new tariff and a severe customs administrative law.

Section 2

The Trans-Siberian Railway

The completion of the Trans-Siberian railway took place so shortly before the beginning of Russia's great diplomatic and military struggle for the control of that railroad's best trade termini that no satisfactory data are yet available to

show the effects that enormous enterprise will have. Much, too, turns upon the outcome of the present war. It is obvious to the most superficial observer that American and European trade interests in Manchuria and Northern China will be safer under the yellow flag with its blue, green, and red dragon, which, fierce as it looks, stands for the beneficent sway of Sir Robert Hart, than in the claws of the Russian bear, or even under the civilizing empire of the Mikado. But aside from the problematical possible effects of artificial restraints on trade, the Trans-Siberian Railroad will undoubtedly affect the markets and the trade-routes of several of the great staples of Oriental trade, namely, petroleum, cotton, and cereals for Oriental consumption, and silks and tea for Occidental consumption. For all high-class goods, where the saving in time is essential, the Siberian route will be attractive. Neither the Panama Canal nor the combination of well-equipped steam and rail lines across the Pacific and the United States and Canada, can outrival the Siberian route, save in so far as American Oriental trade is affected. So far as American cotton and cereal interests are concerned, they can be protected, even in Manchuria, barring extreme political interference, by the steamship lines now in operation across the Pacific and so rapidly expanding their capacity. The great disadvantage under which the United States labors in competing for a general trade in the Orient arises from the fact that our manufactures are for the most part located on the Atlantic Coast. This disadvantage will be in some measure overcome by the opening of the Panama Canal. Meanwhile the service of steamships of ever-greater capacity in connection with the transcontinental railways bears witness to the ever-growing importance of that trade.

Section 3

The Expansion of Steam-carrying Trade on the Pacific

The sailing-vessel retained an important place on the Pacific long after it had disappeared from any but secondary trade on the Atlantic. The long distances to be traversed, the scarcity of coaling-ports, together with the steadiness of the demand for the slow-sale character of the more important goods transported on the Pacific, gave the sailing-ship an advantage. But during the past ten years I have watched from the windows of my study, which overlooks the bay and harbor of San Francisco, the progress of a mighty but peaceful revolution,—a revolution typical of the whole Pacific trade. Ten years ago, for every ton that entered or left the harbor of San Francisco by steam, nearly two came and went under sail. In 1898 the steam tonnage exceeded that of sail for the first time, and now the conditions of ten years ago are exactly reversed, and more than twice as much goes under steam as under sail, while the total is over fifty per cent greater than in 1898. The hull of many a fine ship lies rotting on the mud flats and in out-of-the-way estuaries around the Bay of San Francisco, pointing the fate of others still afloat. The grain, coal, and lumber trade alone now offer a field for sailing-vessels, and this is fast narrowing, and will be greatly curtailed when the Panama Canal is opened. These conditions are a fair sample of those which prevail all over the Pacific, and yet the growth of the steamship traffic is but beginning.

The definite determination of the fate of the interoceanic canal has been so recently the subject of wide discussion that little more need be said about it. To attempt to determine accurately, in advance, the exact effect of the canal assumes powers prophetic. Some few things are, however, clear. The canal will greatly assist trade between

the manufacturing centers of the Atlantic and the Orient, and also with the west coast of South America; it will afford a cheaper route to market for grain and lumber from the Pacific Coast of North America, and for sugar from the islands of the Pacific; it will force a reduction in the through rates on the transcontinental railroads and still further emphasize the advantage of cost over interior by forcing still larger differentials than now exist in favor of the former. It will mark the end of long-distance transportation in sailing-ships.

Section 4

The Opening of China

The Japanese war with China, bringing in its train the cession of many pieces of China's territory to foreign countries, created a whirlwind in world politics of a very violent character. In the dust which this whirlwind raised it looked as though China was threatened with disintegration. When, after the Boxer outbreak, with its accompanying international military pageant at Pekin, the storm subsided and it became possible to estimate the results, it was seen that from an economical and commercial point of view China had changed but little. Nine cities had been added to the list of treaty ports as a more or less direct result of the Treaty of Shemonoseki. The inland waters of China had been opened to foreigners, and trading and warehouse privileges extended, on paper at least. But the net result to trade during the following six years was an increase of only ten per cent, a rate of increase—less than two per cent per annum on the average—which might well have come without so much turmoil.

The insistence of Great Britain and of the United States

upon the open door in China, while preventing many complications that threatened serious interruptions in trade, had a defensive rather than an aggressive value. It held the doors open, but it stimulated no new trade. In short, the opening of China in any real commercial sense is still a matter of the future. The future, however, is in this respect bright with hope.

The necessity for re-examining the customs duties of China, and of strengthening the hands of its excellent administration, which arose from the arrangements to insure the payment of the indemnity after the Boxer outbreak, afforded an opportunity for lightening the charges on commerce. The most burdensome of all these charges, not so much on account of the actual taxes imposed as on account of their uncertainty, were the interior or *likin* duties. By the terms of the new commercial treaty with the United States, ratified last January, China "undertakes that all offices, stations, and barriers of whatsoever kind for collecting *likin* duties, or such like dues on goods in transit, shall be permanently abolished on all roads, railways, and waterways in the nineteen provinces of China and the three eastern provinces." This does not affect the regular customs duties which were increased by a surtax of about forty per cent, to offset the decrease in revenue due to the abolition of the *likin*. This consummation of a long struggle for sound trade relations with China promises a real opening of China. The ultimate accomplishment of this undertaking may prove beyond the powers of the Chinese Government, but the endeavor in that direction will be watched with great interest.

The railways of China, except the connection with the Trans-Siberian line and the few roads in the north in operation for some years, are still largely a network of paper concessions and partial surveys. Authoritative announcement

has been made of the opening to come this year of about two hundred and seventy miles of new lines.

China is still far from "open" to Occidental trade, rich as are the rewards which come from the interchange of commodities so different in character between peoples so differing in customs.

Section 5

Changes affecting the Great Commodities of Foreign Trade

I have space for a consideration of but three of the most notable commodities:

(*a*) *Sugar.* During the past half-decade there have been changes of considerable importance affecting the production of several of the great commodities of the world's trade. Probably the most notable of these are those affecting sugar. The abolition of the beet-sugar bounties recommended by the Brussels Sugar Convention of March 5, 1902, marks the end of a century's struggle in building up an industry by artificial stimulus. Just before that time reciprocity between Hawaii and the United States and the ultimate annexation of Hawaii by the United States brought a rapid development of great cane-sugar plantations and a marked increase in the output. The restoration of peace in Cuba and the promise of permanent peace under the American protectorate presages a steady increase in that direction also; and, although the Philippines can, for some years to come, produce but a comparatively small amount of sugar, yet owing to their proximity to China they will probably meet any increase in the demand from Asia without drawing upon the European or American supplies. The cane-sugar producing countries, several of which were, but a few years since, the most disorderly in the world, are now policed in a most satisfactory manner.

On every hand there is the promise of a vast increase in the output of sugar. Yet so elastic is the demand that it has responded to the increase in supply thus far without seriously affecting prices. European beet-sugar, after the repeal of the bounties, advanced only about twenty per cent, which was slightly less than the effect expected, while in America, inside the tariff wall, the price of sugar, in spite of the increased supply, has declined only about half a cent a pound. The regularity with which the demand for sugar responds to every decline in price is one of the marvels of modern commerce.

(*b*) *Hemp.* The United States and the United Kingdom have long been the best customers for Manila hemp. But the United States was formerly content to buy its share from English traders. Owing to the removal of the duty and the payment of what is practically a bounty, namely, the reimbursement of the insular export duties on all hemp imported into the United States, we are now buying our supplies direct. The hemp industry has responded to this stimulus in a very striking manner, the total output in 1903 being nearly threefold that of 1899, and over half of the whole goes to the United States. The only discouraging feature is the fact that the resources of this industry are overtaxed and there is a lamentable lack in the preparation of the fiber, reducing its quality in a very marked degree, the premium on good qualities not being sufficient to induce proper care in its preparation.

(*c*) *Cotton.* The ravages of the boll-weevil in Texas and the consequent unprecedented speculative fever in the cotton market has caused a great deal of attention to be directed to the changes in the cotton production of the world. Though not so spectacular as the soaring and tumbling of prices, the thing of vital importance in the cotton trade has been the rapid growth in the demand

rather than any fluctuation in the supply. The decrease of the output of cotton in Texas from the promised yield suggested by the crop of 1900-01 was more than offset by the increase in other states, notably Arkansas, Georgia, and Louisiana; and the commercial crop as a whole was the largest on record. Yet large as it was, the crop did not nearly meet the demands of the spinners who depend upon American cotton. Mills everywhere have been shut down or run on short time. The most marked feature of this growing demand has been the growth of new mills in the United States. It is claimed that the United States now consumes more raw cotton, by nearly a million bales per annum, than any other country, and that it uses forty per cent of the American crop.

The situation is, therefore, a bad one on the whole, a rapidly growing demand not being met by an equally growing supply. The Brazilian output has been greatly stimulated in the past few years, and, unless the American conditions improve, will become a very important factor. So far as the demand can be foreseen, it will continue to grow. The opening of China will largely affect the problem in the future.

Part III

The Political Situation as affecting Foreign Markets

We have passed in review the recent changes in the theory of foreign markets and the more important of the concrete changes in the condition of the markets themselves. It remains to review the political situation, always more or less fraught with meaning for the world's trade so long as "national economics" rule. Space will permit of only a brief glance at two of the most important phases of the present situation; first, the agitation for protection in England; and second, the necessity for tariff reform in

the United States. In this we shall necessarily take the American point of view.

Section 1

Mr. Chamberlain's Fiscal Policy

After half a century of free trade in England, a strong party is now considering the advisability of resorting to protection. Although it certainly cannot be said that the proposals put forward by Mr. Chamberlain are "viewed with dismay" in the United States, yet it is true that they are matters of serious concern. In industrial circles the feeling seems to be that we shall be able, when the time comes, to adjust our trade to the new conditions; but we are much concerned to know the direction in which the adjustment will be necessary and the time when it will come. It is, at present, extremely difficult to anticipate what is likely to be done. Not only is there the problem of anticipating how far the programme is likely to meet with the support of the people, but the leaders themselves present a somewhat shifting programme. With true English conservatism, Mr. Chamberlain has been careful to disclaim any sympathy with protectionists, and the leaders, to quote Mr. Balfour, "approach the issue from a free-trade standpoint;" and yet, starting from that standpoint, they seem to be proceeding with some rapidity in the direction of protection, judging from the more recent of Mr. Chamberlain's utterances at Welbeck that "the effect of free trade on the laborers of this country has been disastrous." The programme put forward each time is characterized as provisional and subject to modification. That part of it, however, which seems to be most widely accepted and which develops most directly from the objects which those who have advanced it have in view, is of vital interest to the

United States. The main object of Mr. Chamberlain's proposed policy seems to be to cement a closer union of the Empire and to draw the colonies nearer to the mother country, thus strengthening the Empire for national or imperial defense. If this object is to be attained by preferential tariff legislation in favor of the colonies, it cannot but seriously affect a number of important American industries. And if as seems almost inevitable, the more general scheme be entered upon and compensatory duties should be allowed British manufacturers, it will involve a considerable amount of actual protection. In the programme outlined by Mr. Chamberlain in his speech at Glasgow, on October 7, 1903, he proposed tentatively to lay a tax of two shillings a quarter upon all foreign grain excepting maize. Joined as this proposal is with a distinct purpose to build up wheat-farming in the colonies, and especially in Canada and Australia, by special exemptions and concessions which shall insure them a market in England for all their surplus grain, it constitutes a certain menace to American agricultural interests. For, although the importations of food-products into Great Britain from the United States fluctuate from year to year with the changes in the crops in different parts of the world, yet, roughly speaking, Great Britain still takes about fifty per cent of her necessary food—wheat, flour, and meats—from the United States, and any curtailment of this market, which, even at the present time, takes about one-sixth of the American output, cannot but be a matter of serious concern to the United States.

Wheat-growing in the United States is still so important an industry that its prosperity or the reverse may well-nigh be said to mark the prosperity or depression of all industries throughout the United States. The predominance of wheat-growing is not so great as it was a few years ago,

but, nevertheless, any disturbance of that industry would be felt the length and breadth of the country. The wheat-growing industry has already suffered a series of setbacks, especially through the competition of the Argentine Republic, and lately through an increased acreage and output from Russia. Any further curtailment of the market for the surplus wheat of the United States will be felt immediately. These considerations are, however, offset by certain others which may have considerable weight. In the first place, there has been a marked increase in the home demand for wheat and flour products, an increase in the Asiatic demand, and a promise of a still further increase in the consumption of wheat and flour in China since the removal of *likin,* the duties already referred to. More than that, the area of new wheat land available is somewhat limited, and the possibility of increasing the output upon the acreage now under cultivation is not very large. With the growth of population, land once used for wheat is found to be better adapted to other uses and is removed from the wheat acreage. There is, therefore, to be anticipated an increase in the demand in other places which would partly offset any loss in the English markets, and a tendency in the acreage under cultivation toward stability or possible diminution.

In the earlier speech above referred to, Mr. Chamberlain suggests a duty of five per cent on flour, meats, and dairy products, but he was inclined to exempt bacon on the ground that it was a "popular food for some of the poorest of the population." This proposal is not likely to work serious interference with the market for American meats. Five per cent is scarcely a protective duty, especially with the exemption of so important an item as bacon. The strictly protective features of Mr. Chamberlain's programme, such as the desire to give a "substantial preference" to British flour-mills, to prevent the "dumping" of

surplus iron and steel manufactures from America on the English market, are also so moderate as not to be considered dangerous. The unavoidable restraint upon trade which the re-establishment of any system of customs duties in England will impose is more serious, perhaps, than the protectionists' proposals themselves. Rapid as seems to be the growth of favor toward Mr. Chamberlain's financial policy, no one can foresee the result at the present time.

Section 2

Tariff Reform in the United States

The preliminary skirmishes for the present presidential campaign in the United States gave rise to the expectation that, whichever party might come into power in the next administration, an attempt would be made at a revision of the tariff in the United States. The temper of both conventions, however, excluded from the platforms any expression upon this important subject which made any definite promises; the Republicans contenting themselves with the general statement that if any tariff reform is to be undertaken, it would be safer to intrust it to the hands of the friends of protection than to its enemies; and the Democrats outlining a no more definite scheme for revision than might develop from their free-trade traditions. As the complexion of the Senate makes Republican control for some time to come a certainty, any revision of the tariff must necessarily be made along Republican lines. With the apparent willingness of some of the more influential leaders to entertain some plan for a gradual revision, so moderate as not to affect existing industries, there is still a possibility that something may be done in this direction.

As the extent and direction of this revision, should it ever be undertaken, will necessarily be determined by purely

political forces, economists are interested mainly in the method by which it may be undertaken. Economic writers have frequently pointed out that the methods pursued in the past for revising the tariff were unsatisfactory because of the failure to collect, in a thorough and systematic manner, the data necessary for a revision. Few, if any, of the leaders now in Congress have even a modicum of the knowledge necessary for a revision of the tariff. This may be said without any disparagement, for, in fact, there are few men in the whole country who have that knowledge. The precise effect of each of the duties on some four thousand different articles covered in the fourteen great schedules of the tariff cannot be ascertained by a hearing conducted by a congressional committee in the hurry of preparing proposed legislation, and at which only interested parties are examined. Only by an extended and painstaking investigation along strictly scientific lines can the effect of the present tariff or of proposed changes be ascertained. The complex interrelations which arise from the changes in the relative importance of different exports and imports as affected by different duties offer problems which are among the most difficult in the whole field of economic science. Temporary commissions appointed to gather data desired for the information of Congress when a tariff revision was under way have failed, not merely because political considerations have forced Congress to disregard their recommendations, but because their recommendations based on a brief study under pressure of temporary demands could not be altogether sound and well matured. The following principles may be laid down as generally admitted by impartial authorities: (1) On account of the vast size of the interests involved, sudden changes in the tariff are dangerous to the welfare of the country; (2) for the same reason violent changes are equally dangerous;

(3) changes should, therefore, be gradual and announced long in advance; (4) to ascertain the exact effect of present duties or to estimate the probable effect of proposed changes requires a careful study of each of the industries or branches of trade affected, not only in this country, but in other countries whose goods are affected. If these four points be granted, then no exigencies can arise which should be allowed to prevent what the nature of the work to be done looking to a revision requires, namely, a long and careful investigation of every possible effect of the tariff.

This all points to the conclusion that there should be a permanent bureau connected with the administrative department of the government, whose function it should be constantly to gather and compile, according to the most approved scientific methods, all the data necessary for an intelligent appreciation of the exact working of the tariff. Such a bureau could, when required, extend its investigation so as to cover the probable effect of the proposed changes. Modern economic science is equipped with the methods of research, of analyzing and interpreting statistics, of delving into the forces which control prices, and of ascertaining the cause and meaning of changes in the direction and extent of trade,—in short, it has the methods necessary for dealing safely with the multitudinous and bewildering facts which enter into the problem of the effect of a tariff on the world's markets. There is no reason for groping in the dark, when by a little provision in advance we might walk in the light.

OUR MONETARY EQUILIBRIUM

BY HORACE WHITE

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Two months ago a political convention met in this city to nominate candidates for President and Vice-President, and after struggling a day and a night over the monetary plank of its platform, it decided to say nothing whatever on the subject. This action was equivalent to saying that the standard of value is no longer a matter of dispute. Monetary equilibrium has returned to us after a disturbance of more than forty years. This is merely saying that mental equilibrium has been restored on the subject of money, for the disturbance has been psychological and sociological rather than economical. Every person in his individual capacity in his own *οἰκονομία*, has always preferred gold to irredeemable paper; but multitudes in their collective capacity have preferred the latter to the former, and by carrying this preference into their political action caused the disturbance. The dispute has been a difference of opinion as to the meaning of the word "dollar," some holding that it signified a fixed quantity by weight of the metal gold, while others contended that it meant also the government's stamp impressed upon various things.

In this prolonged contest the borrowing and lending sections of the Union were arrayed on opposite sides, as was

shown by the votes which they cast. The states having a relatively dense population and concentration of capital adhered to the gold standard. They accepted irredeemable paper as a temporary necessity, but were inflexibly opposed to any lasting change in the definition of the dollar. Those states in which contrary conditions prevailed were in favor of cheaper materials for the making of money, because they thought that money would thus be more easily obtainable. A relatively small number of instructed persons, not belonging to any particular section or party, but distributed among all, held a balance of power and a preponderating influence. In all the vicissitudes of the contest they were able to count upon the executive branch of the government, which held the legislative branch in check on some critical occasions.

The Legal Tender Act of 1862, an incident of the Civil War, first unsettled people's minds on the question: What is a dollar? There was no such question under debate previously. We had had controversies in plenty about bank-notes, but nobody had imagined that a piece of paper was real money, or could ever be made such. The distinction between paper promises and real money was sharply defined and was kept alive by frequent bank failures and by the numerous "bank-note reporters," which were used in business circles to distinguish between notes that were at par and those that were at a greater or less discount.

In 1862 there came into the hands of the people a new kind of paper currency called greenbacks, which seemed to be at par, although they were actually at a discount. The average citizen, unless he was a dealer in money or was engaged in foreign trade, did not observe the discount. He perceived that the greenbacks would pay his debts and buy the things he wanted. If the prices of commodities were somewhat higher than before, they affected both his sales and his purchases. If he had a fixed income or was a wage-

earner, and if his receipts did not keep pace with his expenses, he thought that the difference was caused by the war. So the definition of the dollar underwent a gradual change in the common mind. Instead of being a fixed quantity of metal, it might be the government's promise to pay the same at an indefinite future time. Five years after the end of the war this new definition received the sanction of the Supreme Court both as a legal and as an economical proposition. When the court declared that 25.8 grains of coined gold was in no sense a standard of a dollar, it gave a footing and a license in Congress and on the hustings to every possible vagary in finance. Congress, in 1874, availed itself of the court's permission to pass a bill increasing the amount of greenbacks then existing. But fortunately it was stopped by a presidential veto, which caused the party in power to turn suddenly about and pass a specie resumption act. This veto was the pivot upon which our financial policy turned; for, although without it we should have found our true path eventually, it would have been after a longer period and a more painful experience.

The Resumption Act was passed to meet a political rather than a financial exigency. The party in power was rent in twain by the veto of the Inflation Bill, and the only way for the fragments to come together again was for Congress to accept the President's platform. It was a case of Mahomet and the mountain. If the President would not agree to inflation, then Congress must agree to resumption. That it did so with reluctance was proved by subsequent events. General Bristow, then Secretary of the Treasury, informed me that it was with much difficulty that Senator Sherman was brought to the support of a resumption policy. Mr. Sherman was a man of clear and sane ideas on finance, but of extreme timidity in facing hostile votes in his own state. His hesitation in adopting a policy of resumption in 1875

was indicative, not of any misconception in his own mind, but of much misconception in the public mind, which manifested itself in the house two years later by the passage of a bill to repeal the Resumption Act altogether. This bill failed in the Senate by only one vote. Failing to repeal the Resumption Act outright, Congress passed by large majorities a bill to forbid the retirement of the greenbacks, whose redemption the Resumption Act had provided for. It was commonly believed that the retirement of the redeemed greenbacks would cause contraction of the currency. The fact was overlooked that the gold with which the greenbacks were redeemed would take their place in the circulation, in the form of coin or certificates, so that there would be no contraction.

Doubts existed as to the ability of the Treasury to resume on the appointed day, notwithstanding a slow but persistent decline of the gold premium. These doubts were felt even by men in the higher ranks of finance, and some Wall Street capitalists lost large sums of money by speculating on a speedy exhaustion of the government's redemption fund. The saying of an influential banker, who was not a speculator, that he would give a large sum to have the foremost place in the procession at the door of the sub-treasury on resumption day, was widely repeated and generally approved. These doubters had failed to give due weight to events which were lowering the gold premium independently of the action of the Treasury, and which would soon have extinguished it altogether, even if no Resumption Act had been passed. Given a fixed sum of depreciated currency in a growing country, the demand for the circulating medium increases *pari passu* with population and wealth, and augments the value of the currency by the law of supply and demand. Secretary Boutwell was right when he said, in 1871, that the country would grow up to the volume of

greenbacks and that the gold premium would disappear in obedience to natural causes. Although he was right, neither he nor anybody else imagined that the growth of business would overtake the volume of the greenbacks within eight years. That it did so may be reasonably inferred from the fact that the gold premium disappeared before the date fixed for resumption and that when the redemption bureau was actually opened, scarcely any gold was called for. But the danger which menaced the cause of sound money during the interval (1871-1879) was not economical. The real danger was that public opinion would demand, and Congress would vote, an addition to the volume of greenbacks. And if Congress should vote for one such increment, there would be no assignable limit to future additions.

Specie resumption was followed by a period of great prosperity, which would soon have extinguished all differences of opinion touching the definition of the dollar and would have brought about the desired equilibrium in 1879, but for an unexpected circumstance. Between the passage of the Resumption Act and its execution, the gold price of silver fell ten per cent in the market.

This was an unheard-of phenomenon in the modern world. Various causes were assigned for it by experts and ignoramuses, by economists and politicians. Some said that it was due to the great output of silver from the Comstock mines; others, that it was a consequence of the lessened demand for silver in India. Still others thought that it was caused by the demonetization of silver by Germany. Some even contended that our Demonetization Act of 1873 was at the bottom of the trouble. Official investigations were made in various countries, including our own, which yielded scanty results.

We can see now that all of the foregoing reasons were either half-truths or wholly erroneous. Forty per cent of

the product of the Comstock mines was gold. The surplus of silver was, therefore, only twenty per cent of the total output. The difference was too small to account for the disturbance.

The demonetization of silver by Germany was not a *vera causa*. It was itself the result of something else. A nation does not take the trouble to change its standard of value without good reason. It does not incur the expense of recoinage and suffer heavy loss by the sale of the discarded metal from mere caprice. The lessened demand for silver in India was likewise an inadequate explanation. If it were due to a gradual substitution of gold for silver, both for money and for ornaments, it was akin to what was going on in Germany, *i. e.*, it signified a change in the public demand and the public taste. If due to a bad harvest and consequent poverty, these were events of frequent occurrence in India. Why had they not affected the relative values of the two metals before? As to our own Demonetization Act, we had no silver at that time to demonetize and throw on the market. Moreover, the passage of the Act was not generally known until after the great decline of silver had taken place. It was the latter event that first drew attention to the former.

Looking at the phenomenon from the superior standpoint of the present day, we can see that the great decline of silver that began about the year 1871 was due to uncontrollable commercial causes, which the governments of Europe and America could not have resisted even if they had tried. Gold had been the real standard of value in the civilized world long before. As the metal most acceptable and most convenient for the settlement of international balances, it had become the cynosure of the trading community. Every drawer and receiver of a bill of exchange had his mind fixed upon gold when drawing or receiving it, even though

the bill itself were payable in silver. Hamilton observed this fact as existing in our own country in the latter part of the eighteenth century. England had been under the single gold standard twenty-four years before she became conscious of the fact and gave legal sanction to it. Germany was in the same situation long before 1871, although legally under the single silver standard. Under such conditions it was inevitable that whenever circumstances should impel the nations to overhaul their monetary systems they should adopt the single gold standard, thus making the law conform to the fact. Circumstances impelled Germany to reform hers in 1871, and she took the inevitable step. Her act was not the cause of the decline of silver in the early seventies, but was rather the sign and symptom of a commercial movement which was working with irresistible force in Germany and everywhere, and had been signalized some years earlier by the Paris Monetary Conference of 1867.

But whatever may have been the causes of the phenomenon, it took place in our own country at a most unfortunate time, in the midst of a monetary and political crisis, when it could produce the greatest confusion by freshly unsettling the public mind and breaking the peace that had been nearly won by the passage of the Specie Resumption Act.

Europe did not wholly escape this disturbance; but in Europe the task of dealing with it was assigned to a small group of experts in each country, the mass of the population taking no interest in it even if they were aware that anything unusual had happened. The same course of proceeding would have been followed here if circumstances had been the same. All of our previous coinage legislation, from that of 1792 establishing the Mint to that of 1873 demonetizing silver, had been the work in each in-

stance of a few experts, the mass of the people giving no thought to the matter. The same popular apathy would have existed in 1876-1878 regarding the decline of silver had not public feeling been already inflamed over the greenback question. But for this special and temporary excitement we should have contemplated the decline of silver in the same way that other civilized countries did. We should have congratulated ourselves that we had no stock of that metal on hand upon which a loss must be incurred. We should have been thankful that the Demonetizing Act of 1873 had been passed in time to prevent us from sharing the embarrassments of France, Germany, and India. Our monetary equilibrium would have been reached when specie payments were resumed in 1879, and we should now have four or five hundred millions more gold and less silver in circulation than we actually possess, since all of our silver certificates might have been gold certificates if Congress had so willed.

Two matters of importance, both incidental to the Civil War and contributing to our monetary equilibrium, remain to be mentioned. First, the national banking system. The public records show that Secretary Chase adopted this plan as a means of selling bonds and procuring money for the war, but that it had no perceptible effect in that way. To recast the banking system of a nation requires time, even when one knows how to go about it and has all power in his hands. Mr. Chase's *modus operandi* was defective, and he did not have unlimited power. The plan contemplated that all banks should secure their circulating notes by government bonds deposited in the Treasury, but the federal tax which eventually compelled them to do so was not enacted until the beginning of 1865, and was not put in force until after the war was ended. Consequently no bonds were bought for this purpose during the progress of the

war, except a mere bagatelle taken by the voluntary action of a few banks. Nevertheless the new banking system was and remains a gigantic success for banking purposes and a great bulwark of our monetary stability. So far as it supplies us a currency, it supplies one that is at par everywhere. It organizes credit and vitalizes the productive capital of the country admirably. It does not, however, supply a circulating medium to the extent that its resources and reputation would justify. Of $2,500,000,000 now circulating, national bank notes are only $432,000,000,—about one-sixth of the whole, and little more than one-half of what the law authorizes the banks to issue. The bank-note circulation does not keep pace with the country's growth in population and trade, and since all other fiduciary circulation is limited by law and has reached its limit, further expansion will be mainly by means of gold certificates.

This brings us to another incident of the war period, which has proved to be a great convenience and an aid to monetary equilibrium. The law authorizing the Treasury to receive deposits of gold and to issue certificates therefor of $20 and upward was passed in 1863. In the panic of 1893 the greenback redemption fund was reduced below $100,000,000. The law required that the issuing of gold certificates should be suspended whenever that condition existed. For some unexplained reason the Treasury officials thereupon treated the law as though it were repealed, and refused to resume operations under it when the gold reserve was replenished. Congress accordingly reënacted it in the year 1900, at which time the amount of gold certificates outstanding (held mostly by banks for clearing-house purposes) was $228,000,000. The volume of certificates has since increased by leaps and bounds. It is now above $500,000,000 and is still growing, and most of the increment has gone into general circulation, in obedience

to a demand for a paper medium of exchange that could not otherwise be satisfied.

While nothing of this kind was contemplated by Congress in the original enactment of the law, it must be regarded as most fortunate in two particulars. It has contributed to cure the prime defect in the national banking system—the rigidity of its note issue—and has saturated the currency with gold. Each new certificate is a prop to our monetary equilibrium, since it increases the proportion of gold to the credit circulation. That proportion at the present time, counting only the gold in sight, is as 66 to 100, being about the same as that of the Bank of England. Our proportion would be even greater than it is if gold certificates could be issued of lower denominations than twenty dollars. There is no valid reason why ten-dollar certificates should not be issued. They are greatly needed now, the Treasury being unable under present laws to meet the public demand for the smaller denominations in any kind of paper circulation. Of course, gold eagles, halves, and quarters can be had without limit as to quantity, but our people do not like to carry metal in their pockets, except for small change; moreover, the frequent handling of gold involves waste and loss by abrasion. The very next reform in our money system should be the lowering of the denominations of gold certificates to ten dollars, both as a public convenience and as a further support to our monetary equilibrium.

What we mean by monetary equilibrium is a state of absolute confidence that every dollar in circulation, whether of paper or of metal, is the equivalent in the hands of the holder of 25.8 grains of standard gold. Have we reached that state of confidence? If not, how far do we still come short of it?

Probably ninety-five per cent of our people are perfectly

satisfied on that point now. Yet the remaining five per cent think that there is still some room for doubt. They know that the continued redemption of the greenbacks depends upon the will of Congress, and they remember that only ten years ago Congress refused to do anything whatever to replenish the redemption fund when the Treasury was only two days removed from bankruptcy. What protects us against a similar crisis hereafter?

I have already alluded to the action or non-action of the St. Louis Convention, which assures us that no political party now calls in question the standard of value. This is perhaps the strongest guarantee we could have against a recurrence of the crisis of 1893, but our position has been improved in other ways. The Act of March 14, 1900, increased the gold reserve for the redemption of legal-tender notes by fifty per cent, and provided for its replenishment in case of need, and it made the notes expressly redeemable in "coin." It separated the fiscal from the currency transactions of the government and prohibited the use of the gold reserve for any other purpose than the redemption of notes. But it authorized the Secretary of the Treasury to pay the notes out again "to purchase or redeem any bonds of the United States, or for any other lawful purpose the public interests may require, except that they shall not be used to meet deficiencies of the public revenues."

Now a deficiency of the public revenues cannot be judicially ascertained without a standard of a full or non-deficient revenue. The law does not supply such a standard. Apparently a deficiency means a shortage of ordinary income as compared with ordinary expenses during one fiscal year, regardless of any preëxisting surplus or deficit in the Treasury. But there are extraordinary expenses and extraordinary receipts in time of peace and still more in time of war. Where is the line to be drawn which

shall separate the ordinary from the extraordinary? A little reflection will show that this saving clause in the Act of 1900 is meaningless, or, at most, only advisory. The Secretary of the Treasury must determine for himself whether a deficiency of the public revenues does or does not exist at any time. In other words, the paying out of redeemed greenbacks is optional with him, as it was before. This is a defect in the law which ought to be cured by an explicit proviso that legal-tender notes presented for redemption shall not again be put in circulation except in exchange for gold deposited in the Treasury by private persons. Thus the reissued greenbacks would be gold certificates in fact, although not in form; and in time public opinion would require that the form be changed so as to correspond with the fact.

Are our silver dollars to be considered a source of anxiety? Theoretically they are. They are a part of the fiat money of the country. They are like the greenbacks in all essentials. They circulate by virtue of the government's stamp, and the government accepts them in all payments to itself. There are $576,000,000 of them, $70,000,000 being in circulation as coin and the remainder as certificates. The field of retail trade has been practically reserved for them by law, and the growth of the country has been so rapid that the redundancy of 1894 has become a deficiency in 1904. There is not enough currency of denominations under ten dollars now to meet the legitimate demands of trade, and while this condition lasts silver dollars must be at par, just as the subsidiary coins are. True, the latter are redeemed at the front door of the Treasury, but the dollars are redeemed at the back door, in the custom-house, and in the tax-office. That a real danger once existed from silver coinage was proved by experience, but it seems to have passed away. It should not be forgotten,

however, that the government paid $464,000,000 gold for the bullion from which these needless dollars were manufactured. This was an unnecessary expense. It is possible eventually to recover this $464,000,000 without throwing any silver on the market. A bill is now pending in Congress, with the approval of the Secretary of the Treasury, to convert silver dollars into subsidiary coins as fast as the latter are needed. The annual increment of subsidiary silver required by the growth of population and of retail trade is about $5,000,000. If the policy is adopted of re-coining the dollars into smaller pieces instead of buying new bullion therefor, the government will finally get back the money that was expended under the Bland and Sherman Acts. Gold will flow in to fill the vacuum, and Congress can regulate the denominations of gold certificates to meet the public convenience.

May we not have too much gold in our circulation for the economical working of trade and industry? Of course our solvency can never be impaired by having an excess of it, but gold is capital. It is the product of labor, and the country may be compelled to use more of it than is really needed for effecting its exchanges and guaranteeing the soundness of its credit instruments. Credit dispenses with the use of capital to an incalculable extent. It is a labor-saving machine of immense value, and it is not to be supposed that we have yet seen the last of its devices or that we have exhausted its utility. It does not fall within the scope of my theme to consider plans for bettering our bank-note system so that it shall keep pace with the growing demands of trade, but such plans cannot be postponed forever in the face of a decreasing public debt and an increasing price of government bonds. If in the meantime we take more gold than is really needful into our circulation, that certainly involves some waste of energy, but of all financial evils it is the one most easily cured.

Although the greenback and the silver dollar are not a present cause for anxiety, all fiat money is objectionable, because it is a noxious microbe capable of multiplication. It would be best to remove it, so that its evil example may not be before the public eye to lure us astray in some future emergency.

It is needless to say anything to this assemblage about the advantages of monetary peace as contrasted with the turmoil through which the nation has struggled during the past forty years. All the reasons which exist for having any kind of money are reasons for having a good kind. It is the agreement of mankind which makes it good, and when we disagree about the definition of the dollar, we are plunged in doubts and fears, confidence and credit are impaired, enterprise is chilled, business partakes of the nature of gambling, widows and orphans are defrauded, labor is deprived of its just reward, and civilization sinks to a lower stage. All these conditions have been within the nation's recent experience.

To sum up: We may say that once upon a time the nation lost its financial pathway by accident and after wandering forty years in the wilderness regained it by a process of self-education. During all its wanderings, however, it never repudiated nor failed to keep any contract that it had made. It has met both principal and interest of its bonded debt in the times and manner agreed upon, and has never imposed any tax thereon or allowed any inferior authority to do so. For all this it reaps its reward in the highest credit that any country ever enjoyed. There are some minor problems of finance yet to be solved, but since they may now be approached without passion, we may fairly expect that they will be solved rightly and in good time. Let us hope that we have learned the cardinal principle of finance, viz., that the monetary standard is estab-

lished in the first instance by the tacit agreement of mankind, which it is the duty of the statute law to recognize, ratify, and enforce, not to resist, counteract, or annul.

May we confidently predict that the lessons of the past will not be forgotten and that the monetary equilibrium will never again be disturbed? Alas, history teaches that such lessons gradually fade from the public mind. Our colonial experience with bills of credit did not prevent the revolutionary fathers from following the same disastrous policy, nor did their example prevent us from repeating the experiment. Moreover, President Grant's veto of the Inflation Bill did not prevent Congress from passing another one sixteen years later, which was not vetoed and which was attended by disastrous consequences. But history teaches also that such disturbances of the monetary equilibrium usually have their beginning in a state of war. The colonies issued bills of credit in the first instance for war purposes and afterwards for other purposes. The revolutionary fathers did the same, and we also did the same. The teaching of history, therefore, is that if we would avoid the grossest financial errors of the past we should avoid as much as possible the direful curse of war. Perhaps no teaching could be more salutary to mankind.

PRESENT MONETARY PROBLEMS

BY JAMES LAWRENCE LAUGHLIN

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THE development of thinking about money is the most interesting portion of the history of political economy. The first dawn of economic principles came with the discussion of monetary phenomena, and monetary science has not only always had a peculiar practical interest of its own, leading to its constant appearance in political campaigns in all countries, but it has also had an organic life persisting in its full vigor to the present day. In the United States the monetary question is not at this very moment, as it has been, the football of the political parties; but there has been very recently an active upheaval in scientific discussion which is healthy and worthy of attention. In Europe, while the active discussions of bimetallism have simmered down to relative quiet, yet the interest in the fundamental monetary questions among scholars is burning with a clear flame. The present monetary problems are not only enlisting the interest of economic scholars and reach the very center of systematic exposition, but they also happen to be those which have to do with the truth or error of convictions which are widespread among great masses of our countrymen.

It is passing strange that the vast literature of money has not been marked by a passionate zeal for the statement

of an organic body of principles. Past discussions of money have been usually started in some local, or practical, problem; and interest has centered largely in the acquisition of historical data, without any considerable success in the formulation of the principles explaining such data. Once that the problem of special interest to the public had been settled for good or for ill, the real scientific interest seemed to wane. To-day, in my judgment, the case is entirely different. The attention now being given by scholars in both Europe and America to the vital questions of monetary doctrine is nearly as intense as that given to questions of wages and interest.

Functions of Money

Since the time of Ricardo there has been a magnificent confidence that the theory of money has been so well settled that there was little more to be said on the subject. The economic dogma of money, at least, was supposed to be fairly complete. And yet, in my judgment, the systematic treatment of the principles of money has remained undeveloped almost to the present day. There is scarcely any part of the field which can be regarded as thoroughly disposed of. Indeed, the very definition of money itself is to-day under the most critical examination; and with the definition goes the question as to the functions performed by money. On these points, like investigators in other sciences, we must frankly admit our lack of agreement.

First of all it should be emphasized that the dispute about the definition and functions of money is not merely a question of words; it relates, in truth, to fundamental problems of great practical import. Every day the statesman and man of affairs are confronted by difficulties connected with the primary effect of "money" on prices in general; but it is at once patent that the relation of the

value, or quantity, of "money" to prices cannot be disposed of until we have determined what we mean by "money." As at present used, "money" has no scientific precision; it is often carelessly employed in many different senses by one and the same author.

Evidently before a rational definition of money can be found, some agreement based upon an analysis and description of the functions actually performed by money must be reached. If several dissimilar services are rendered by monetary instruments; if each of these services is associated by usage with "money," and if it happens that different things are employed in these different services, then, while authors may agree as to many of the functions of money, it may easily happen that they may still disagree as to which shall be regarded as essential to the definition of money. Money may have different meanings according as it is made to include, or exclude, some or any unquestioned services associated by usage with money. In such ways, an important difference might arise between that which is money in an economic, or true sense, and that which is money in a legal sense. In fact, the economic relations of money ought to be scientifically ascertained before legal functions should be assigned to it. If, for instance, the state should apply the quality of legal tender loosely to some instrument which does not completely fulfill all the functions of money, then that money is not, in the economic sense, true money. It thus often happens that incomplete forms of money exist, which give the public much difficulty to classify and define. The expressions "substitutes for money," or "surrogates," or "representative money" have arisen which depend for exactness upon the primary meaning assigned to the money on which they depend. The very functions of money need careful limitation.

Among writers as late as John Stuart Mill there is practically no separation of these functions. The term "money" was applied indifferently to an instrument which served only as a medium of exchange, or only as a standard, as the case might be. Obviously, it would not be possible here to summarize all the different ways in which the functions of money have been viewed; they vary with each writer. In the main, there is a discussion upon the merits of the following separate functions:

1. A medium of exchange.
2. A standard, or measure of value.
3. A standard of deferred payments.
4. A legal means of payment.
5. A store of value.
6. A means of transferring value, or capital.

The most recent German writer, the distinguished scholar Helfferich, in an epoch-making treatise,[1] holds that there are only two primary functions of money, neither being secondary to the other: (1) Medium of exchange; (2) means of payment. He does not regard the standard function as essential to the conception of money, believing that any such service as may be included under a measure of value has been derived from the two primary functions given above. With several other writers, he finds that the medium of exchange was the thing which first developed, and then came into general use as a standard or measure of value. He practically defines money as everything serving to facilitate exchange between economic factors. Thus Helfferich would hold that the state, by giving legal-tender power to things worthless in themselves, such as irredeemable paper, has created a means of payment for debts, and therefore he would include even such instru-

[1] *Das Geld*, von Karl Helfferich, Leipzig, 1903, 8°, pp. x + 590.

ments as these under money, because they fall under one of his primary divisions.

Whatever conclusions may be reached in regard to the functions of money, the application to the system of any one country would raise difficult questions as to the classification of money. If one of the necessary functions is lacking to any one form of money, it is not true money; for instance, in the United States no one would hesitate to say that gold coin is true money, and yet it is very little used as an actual medium of exchange. Therefore, we may easily call that true money which does not serve principally as a medium of exchange. Also, silver dollars, and French five-franc pieces, in the so-called "limping gold standard," could not be called true money in all senses, because their value is dependent on a primary form of money. Like national bank notes and greenbacks, they are only "surrogates;" they are, perhaps, legal, but not economic, money.

One may well doubt if the function of a means of payment can be distinguished from that of a medium of exchange. At least, most writers seem to agree that the medium-of-exchange function is essential to money; but if the standard function be neglected, could we possibly define that which acts only as a medium of exchange as true money? Of course not. Deposit-currency (*i. e.,* bank-checks) certainly act as a medium of exchange, and as a means of payment; but we should, in all common sense, be obliged to place such currency in a very different class from gold coin.

Therefore every one must agree that the critical discussion of the meaning and functions of money is fundamental to scientific progress and to all serious treatment of the main problems of money, such as the theory of prices.

Credit

In regard to another unsettled problem of money, credit, it is to be said not only that it has been very much misunderstood, but that it has been given very little real study. There is to-day no commonly accepted definition of credit; the element of futurity in a credit transaction is generally admitted, but "confidence" is by some regarded as the essential element; and yet "confidence" can play its rôle only because futurity exists in the credit operation.

Nor is there any received opinion as to the real nature and functions of credit. We seem, in the whole field of credit, to be on the frontier of knowledge. In any true sense, the economic end of society is the possession and use of goods which satisfy wants. Credit has been devised as one of many means to aid in accomplishing this end. In its fundamental relations it has to do with goods and their increase. To some, however, it is related only to money. The truth of this concept, to my mind, depends upon the nature of money. If it be only a means to an end, and if it does not alter the elemental principles of value, but aids and cheapens the exchange of goods, then it is easy to understand that a borrower in reality obtains the use of goods, as the purpose of a loan, and that money and credit are but the instruments devised by society for effectually carrying out that purpose. Hence the credit operation, as regards extension or contraction, is primarily based on transactions in goods; its relation to money is a secondary, and incidental, connection. Credit being a transfer of goods involving the return of an equivalent in the future, forms of credit appear only as a consequence of transactions in goods. More transactions, not more money, cause an increase of forms of credit; and, by an interesting process of evolution, forms of credit, especially

the deposit-currency of banks, act as a medium of exchange, obviating recourse to money. The belief, however, that credit depends on money, and not on goods, is widespread, and much discussion is probably before us on this point.

The relation of credit to the theory of prices is evident; some think that all the money plus all the credit (whatever that may be) act primarily to fix the level of prices; but any sane person will see at a glance that the forms of credit, such as bills, drafts, etc., arising from the movement of the wheat crop, have no effect on the price of that crop, the price having been made antecedent to the creation of the forms of credit which came into existence only because of the actual sales of wheat. Does a farmer wait until he sees how many wheat bills are drawn before fixing the price of his wheat? Evidently not; and the popular conception needs thorough criticism.[1]

When men speak of "our expansion of credit," they have a very vague and general idea in their minds. The definite and distinct forces at work are covered with darkness; and when a revulsion of trade comes the results are accepted as coming from some undefined and mysterious force which can only be felt, but not explained. It remains the duty of the economic thinker to outline with scientific exactness the forces uniting in the upward wave of overtrading, and to state with equal definiteness the causes of the receding movement. Principles must be sought for which will explain the differing actualities of each special crisis.

Theory of Prices

Only after the honest student has come to a satisfactory conclusion in regard to the nature of money and credit is

[1] For a full discussion of "Credit," see my *Principles of Money*, chap. 4 (1903).

he in a position to discuss with profit the pivotal problem of this field—the theory of prices. Perhaps I may be criticised for treating here the present monetary problems from too theoretical a point of view; and it may be urged that I should have presented the practical problems confronting each leading nation, and discussed their relations to the several monetary systems actually in use. But I must respectfully insist that the moment any practical problem in any existing monetary system is taken up, one is instantly faced by the difficulty of agreement upon the terms in use, and in fact upon the simplest monetary principles involved in the examination of each case. Every practical reformer in the field of money is in fact using some theory of prices, true or false, in all the premises laid down in his propositions. One might as well go into practical engineering without a knowledge of thermodynamics as to discuss practical monetary schemes without first settling basic monetary principles. But, unfortunately, the thinking, even among so-called economists, is to-day unsettled on so pivotal a question as the theory of prices. Practical monetary legislation, in more than one country, would be radically modified, accordingly as the so-called "quantity theory" of money is accepted or not. In my humble opinion that theory is indefensible and erroneous; and yet our great politicians in the United States, in their fencing on the monetary problem, have decided that the question of the gold standard has been definitively settled because of the large recent production of gold. The partisans of gold have thus accepted the principle on which the demands for an extension of the circulation of silver and greenbacks have been based, and the position is absolutely untenable.

The issues in this crucial problem are unmistakable, and they must be threshed out to a conclusion before any prac-

tical applications can be attempted. These issues may be briefly stated in the following heads:

(1) Is the price of goods the quantity of some standard commodity for which they will exchange, or is it the relation between goods and a variety of several media of exchange?

(2) If true money is a commodity, like gold, then what determines the exchange value between goods and that commodity? Is the problem in any way different from that of obtaining the exchange value of any two commodities?

(3) What is the actual process of evaluation between goods and gold?

(4) If demand and supply regulate the value of money (cost of production apart), what is the exact meaning of demand for money, and of supply of money?

(5) Is the demand for a money-metal only the monetary demand? Is the demand for a commodity *as money* something *sui generis?*

(6) In the theory of prices, what is meant by "money?" Is it only gold, or gold together with everything, such as deposit-currency, which acts as a medium of exchange? In short, what constitutes the supply of money?

(7) If prices are influenced by "purchasing power," is that synonymous with the sum of the existing media of exchange, multiplied by its rapidity of circulation? Or, is purchasing power in its ultimate analysis synonymous with the offer of salable goods?

(8) Have the expenses of production, or progress in the arts, no influence on the general level of prices?

(9) What is the effect of credit on general prices?

(10) How do fluctuations in bank reserves actually affect general prices? Does the rate of interest, being paid

for capital and not for money, have an effect on prices through its effect on loans?

(11) By what economic process would a great new supply of gold influence general prices? Only by being directly offered for goods as a medium of exchange?

(12) Does the Ricardian reasoning in favor of the quantity theory of prices hold in monetary systems where free coinage of the standard money exists and where other devices are used as media of exchange? If mints are open, how can the coin differ in value from the bullion of which it is made?

It is safe to say that the thorough discussion of these points, and a satisfactory disposal of them, will aid in the solution of the central monetary problem, not only of the past but of the present time. It is one which cannot be blinked. It arises at every step in popular monetary discussions, and the economists have not given it necessary attention. Of the settlement of the theory of prices, of the value of money, a host of minor questions which have caused endless and fruitless differences of opinion will disappear. The solution of this matter of theory is of the greatest practical import; it is as important to practical monetary action as a theory of heat is to mechanics. Therefore, let us not be deterred from a struggle with a fundamental matter of theory by any slighting and cheap sarcasm about the futility of theoretical and abstract discussions. As well scoff at the mathematics which lies behind physics and astronomy as theoretical.

Nor will it be wise to minimize the differences between the old and new points of view in the theory of prices. It may be said that the quantity of money would have an influence on general prices in any theory. True; but that does not touch the crucial point at issue. The quantity theorists make the process of evaluation between goods and

money dependent on the actual offer of the money and goods for each other; an increase of transactions in goods is an increased demand for money, resulting, unless the quantity of money is increased, in falling prices. It is needless to say that the facts do not agree with these statements. An inductive economist who would be unwilling to state any principle which had not been the outcome of a study of concrete data could never, under any possible circumstances, have arrived at the quantity theory of money. In no case coming under my observation has there ever been any correspondence between the movement of general prices and the known facts as to the quantity of circulation, or the money-work to be done. If I am wrong, it lies in the power of induction to disprove my statement by the facts. In truth, the quantity theory was the product of the metaphysicians, and not of the men of affairs, and it never has been in accord with the data of inductive study so far as I know.

It is true that a great increase in the supply of gold would lower its value, other things remaining the same; but the effect on general prices would be a simple one, such as would be produced by any cheapening of the standard, like a change to a depreciated paper standard. But this change in the value of the standard is a radically different economic process from that by which prices are said to be influenced only by changes in the quantity of the media of exchange actually offered for goods. One or the other must be wrong.

Prices and the International Movement of Metallic Money

The settlement of the theory of prices, or the principles determining the value of money (suitably defined), has an importance reaching out into the field of the international

movements of specie. We cannot properly formulate the methods by which the shifting of specie and goods act upon each other in international trade without having previously reached a definite conclusion upon the theory of prices. Thus the examination of and agreement upon the theory of prices will largely determine the statements made concerning the relation between the shipments of specie and the level of prices within a country.

With the Ricardian formula, derived from the experience of England in the early part of the last century, writers have attempted to solve this problem by using the quantity of money in a country as the force regulating the general level of prices; if gold is exported, prices must fall; if gold is imported, prices must rise. In brief, the originating cause of a change in the general level of prices, so far as international trade is concerned, is the shipment of specie. The movement of goods is a consequence of the change of prices brought about by the addition or subtraction of specie. That is, the quantity theory has been relied upon to solve this highly important and practical problem of money.

The original statement of Ricardo has, of course, been added to and amended; but, in the main, it is intended to show that any one country obtains a part of the world's circulation of specie in the proportion that its trade bears to that of other countries. This quota of gold, for instance, is retained in a country by influences working automatically on the price level through changes in the quantity of gold within that nation. If gold is withdrawn, prices fall, exports of goods are increased, and in due time the gold begins to return until the country's quota of gold reaches an equilibrium adjusted to the relative demands of other countries. The movement of goods forms the variable in the process which aims at a correction of the quota

of gold, whenever the equilibrium has been disturbed. The shipment of gold is the initial cause; the movement of goods is a consequence.

In support of this view, the orthodox view, it is held that gold will flow wherever its exchange value is highest. The flow of gold will make it abundant in the receiving nation, and thus raise general gold prices there, or, *vice versa,* will lower prices in the countries from which gold is taken. The possession of the proper amount of gold seems to be the main consequence, while commerce is regarded as the means to the end.

This manner of treating the problem, however, reverses the true order of events. Commerce is the real objective which lies behind all other phenomena, such as the methods of payment; the movement of money is a secondary operation, dependent on the direction and extent of the shipment of goods. Moreover, to say that gold, like other goods, flows where its exchange value is highest, is a truism; the real question to be settled is, How does the flow of gold take its effect on prices? To say that because it is abundant, it raises prices, is to assume the whole problem at issue. How does a cheapened mass of gold adjust itself to other goods? What is the price-making process? Are goods priced only by an actual exchange of those goods against the increasing flow of gold? On this point the adherents of the orthodox teaching of Ricardo have offered no light.

The trouble with many symmetrical monetary theories is that they do not agree with the facts. For instance, it has been pointed out that the gold stock of the United States has increased three and one-half times from $326,000,000 in 1880 to $1,174,000,000 in 1902; and yet that gold prices in the United States in that period have fallen. This discrepancy between fact and theory is dogmatically disposed of by assuming that the growth of our trade has

outstripped the supply of gold. This position is far from tenable; there are no statistical data in existence worth a fig which could give us the truth as to the money-work, or demand, for gold. To say that our gold has increased only because of our phenomenal increase in trade relatively to other countries, is to make a statement without proof. Possibly our deplorable silver legislation of the past has forced us to carry more gold than we ought to have held, just as men on the frontier must invest considerable means in firearms for protection from purely local dangers. Other countries than ours have enormously increased their trade, but they have not added in the same proportion to their gold circulation. In truth, the old-fashioned theory of international price-changes needs restatement in vital parts. It will be found that forces affecting the prices of goods, such as demand and supply of those goods, are of primary influence in affecting prices, quite independent of the action of a medium of exchange, which often comes into existence, in fact, as a consequence of the exchange of goods. The movement of specie is not the end of commerce, but specie moves as an instant consequence of commerce. The monetary changes follow, and do not precede the operations in merchandise.

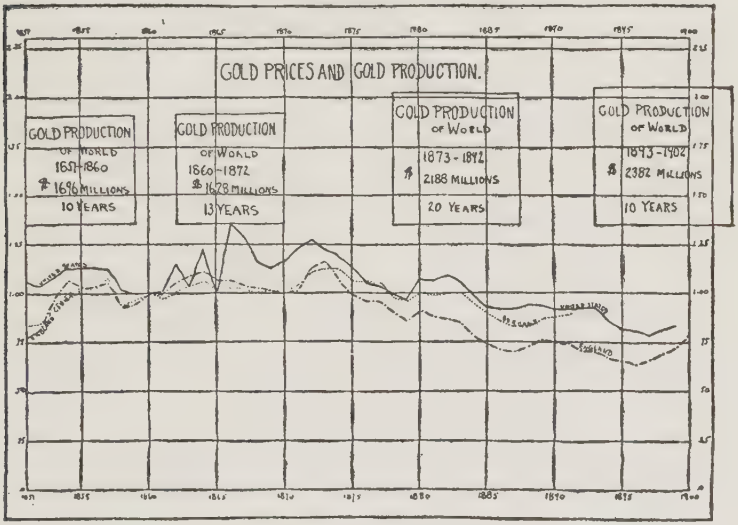
Bimetallism

Bimetallism was eagerly taken up by writers as a means of increasing what was once regarded as a deficient supply of the world's metallic circulation. The decline of prices, which in this country began in 1866 and not in 1873, was attributed to a scarcity of "money" throughout the world. Therefore, if silver could be added to or retained with the circulation of gold, the larger quantity of metallic money would, it was believed, support or even raise the general level of prices. The theory of prices, assumed as a matter

of course in this exposition of bimetallism, was the quantity theory.

Throughout the recent writing and speaking on monetary topics, both in Europe and America, if not also in Asia, there has been a very general subsidence of interest in bimetallism. The demand for silver has been believed to be unnecessary because of the enormous production of gold in recent years. That is, by the old quantity theory on which bimetallism was based, some authorities—and more politicians—have saved their consistency by accepting the gold standard.

The logic and character of bimetallism cannot escape so easily. If the quantity theory falls, the whole artificial structure of bimetallic argument falls; and the gold stand-


GOLD PRICES AND GOLD PRODUCTION.
GOLD PRODUCTION OF WORLD 1851-1860 £1696 MILLIONS 10 YEARS
GOLD PRODUCTION OF WORLD 1860-1872 £1678 MILLIONS 13 YEARS
GOLD PRODUCTION OF WORLD 1873-1892 £2188 MILLIONS 20 YEARS
GOLD PRODUCTION OF WORLD 1893-1902 £2382 MILLIONS 10 YEARS

ard cannot possibly be supported by intelligent minds on any such basis of theory. The facts are too ugly. In the diagram which I have constructed here, it must appear to the most casual student that if the fall of prices on or about

1873 was due to a scarcity of gold, then since the supply of silver has been greatly increased, and especially since the supply of gold has been about quadrupled since 1850, we ought to have witnessed a phenomenal rise of prices in the last decade or two. The movement of prices on the diagram has been generally downward, or at least not seriously rising, during all the years when the production of gold has been so astonishingly large. The facts oblige us to question a theory which presents such evident disparities as this; and one is obliged, in all fair-mindedness, to accept the truth that many other and potent influences, besides the quantity of the media of exchange, have a powerful effect upon the price level. When this admission is made, then the investigator is in a position to understand the remarkable influences of the great industrial revolution of the last thirty years upon the expenses of production of all articles, and hence upon their market prices. Thus, the sweep of economic forces, in the natural tide of events, is bringing us to a saner and very different point of view from that of the scientific bimetallist of past years.

Stability of Exchange

Consistency is a jewel; but it may be questioned whether it is always worth the price. The escape from the pitfalls of bimetallism and the quantity theory has led to some new and surprising formulations. It has been the hope of the bimetallists to secure a parity of exchange between countries now using gold and silver standards. If gold could be maintained permanently at a given ratio with silver, this happy result might have been brought about. It is needless to say that bimetallism proved to be a political impossibility, even in the countries of the Latin Union. By force of business requirements, such silver as has remained in general circulation was effectively kept at a value in gold equal

to its face value by varying devices in different countries, all of which had a common principle, practically equivalent in a more or less evident form to redemption in gold. In the case of India, it is frankly accepted that the value of the rupee has been maintained at a fixed price in gold by a machinery which amounts to the establishment of the gold standard, involving a quasi-redemption of silver rupees in gold at 16*d*.

If, however, there are some silver-loving sensibilities to placate, such a process is not spoken of as the establishment of the gold standard through the indirect redemption of inferior silver by gold, but it has been discovered that a uniform ratio of exchange between gold and silver-using countries can be established, not by the gold standard, but by a "gold-exchange standard." In the recent proposals laid before Mexico and China this new form of statement has been employed. It is difficult to know what the new term means. A bill of exchange in a silver country drawn on a gold country is nothing but the amount of silver coins of the one nation which must be given to buy a stated sum of gold coins of the other nation. The silver bill varies relatively to gold coins in proportion to the changes in the value of silver bullion relatively to gold, unless the silver coins, under the laws of token-money, are kept at an artificial value, above the market value of the silver bullion in them, by some method, more or less direct, of redemption in gold. When silver bills are offered in the exchange market, they are simply offers for the sale of so much silver to be paid for in gold. If then the treasury of the silver-using country buys the bills in certain emergencies of the exchange market, it is paying gold for silver; or, in other words, it is to that extent redeeming amounts of silver in gold.

Stripped of its enveloping mystery, the only way in which the new proposals for Mexico and China can establish sta-

bility of exchange is to establish the gold standard. For that purpose, if the silver coins in common use are to be rated in gold above the market value of the silver content of the coins, the only way in which parity in daily business or in the exchanges can be maintained is by creating a gold reserve large enough to redeem coins at par, or buy exchange at par, if no direct redemption is allowed. The whole operation, therefore, harks back to the principles regulating the value of such money as token-coins, bearing a seigniorage, or paper money which has no value in itself. The worship of quantity as a regulator of value of money may do for those who are unwilling to test their theories by the facts; but inevitably one is obliged to admit that other forces are far more potent than quantity.

The Value of Paper Money

I have said that the pivotal problem in the whole field of money is the theory of prices or the value of money. How true this is may be seen by the recurrence of this issue in each of the problems noted in this paper; and in the last one which I shall take up it again reappears. What regulates the value of those forms of money which circulate at a rate above their content is a question which forces itself to the front whenever we study a case of paper money. In times past it has been sufficient to explain the value of paper money by referring its rise or fall to an increase or diminution of its quantity. This blind reliance on quantity as the main force controlling the value of money cannot now, with our knowledge of the facts, be consistently held.

The amount of notes which a merchant can put out, provided he redeems them promptly, is limited only by the extent of his transactions. So it is with a nation. Given a certain set of business operations, as many notes can be kept in circulation as are needed by the community, and no more;

and these notes will remain at par only if there is a recognized system, not of ultimate, but of immediate redemption. No matter what quantity of notes may be put out, if there is no system of immediate redemption, the notes will depreciate. But if there is an effective system of immediate redemption in operation, then no matter what the amount issued, none of it can depreciate, and only that quantity which is needed by the convenience of the business public will remain outstanding. In this way it may be realized that the element of quantity is incidental to the more dominant factor of redemption.

The connection of the value of the standard money with the paper promises to pay in that standard coin is the one important consideration in determining the value of paper money. Redemption is the only sure means of ascertaining automatically what quantity of paper is needed by the public. Redemption determines both the quantity and the value of the paper.

In the case of irredeemable paper, however, it is often assumed that, in the absence of redemption, the value of the paper is determined directly by the amount outstanding as compared with the uses to which such money can be put. There is believed to be an imperative demand for money, as a medium of exchange, which must be satisfied in some way; and in default of anything better, irredeemable paper will be required, and a value will be given to it by this imperative demand. Then, only if issued in excess of this demand, will even irredeemable paper depreciate. This is the usual explanation of the fact that irredeemable paper, worthless in itself, bears any value at all.

But men of affairs are the last persons to exchange valuable goods for valueless paper. They will use any medium only from a business point of view. This paper is a promise to pay; the whole question centers in the probability of keeping that promise sooner or later.

A guess is made on that point, and it is recorded in the value given to the paper, just as in the case of quotations of stocks, not now paying dividends, but believed to have some chance of paying in the future. If the chances of redemption, consciously or unconsciously, become brighter, the value of the yet irredeemable paper rises, without any change whatever in the amount outstanding; or an event which postpones redemption will correspondingly depreciate its value. The history of our United States notes (greenbacks) from 1862 to 1879 furnishes abundant evidence on this point.

There certainly is an imperative demand for a medium of exchange where goods are bought and sold; but there is no monopoly of any one medium by which a monopoly value can be secured for it. As regards metallic money this could appear only in the absence of free coinage; and even with token-coinage it is a question if a value can be given it by monopoly conditions. But as regards the usual media of exchange, there are so many kinds—government notes, bank-notes, bills of exchange, checks, and deposits—that a demand for a medium of exchange can be satisfied by many alternatives. A scarcity of one could not produce such a want that an unlimited monopoly value could be given to it. Especially is this true when we remember that deposit-currency is perfectly elastic, providing a medium of exchange as a consequence of legitimate transactions in goods whenever desired. Such a machinery, expanding according to the work to be done, makes it impossible that the so-called imperative demand for a medium of exchange should ever give to any one medium an exceptional, or monopoly value, due wholly to a limitation of its quantity.

With coins having a seigniorage, such as the American silver dollar or the French five-franc piece, their value is kept at par with gold only by some method of redemption,

more or less direct; and the same general principle applies to the value of paper money, in which the seigniorage may be one hundred per cent.

In this necessarily brief review of the present monetary problems, as known to students of this branch of economics, I have attempted to present the issues in a form which could be understood by the layman as well as by the professional economist. In the nature of things, it has been impossible not to give a setting to these problems colored by my individual judgment. For that I have no apology to make; I assume that it was intended to allow the author to give such an exposition as, by his best lights, would present most clearly the leading points at issue among scholars of money at the present day.

RELATION OF THE SCIENCE OF FINANCE TO ALLIED SCIENCES

BY HENRY CARTER ADAMS

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THE science of finance finds its place in the group of sciences to which it pertains through the relation it bears to political organization. This is true because of the nature of the task imposed upon the public financier. He it is who provides for the support of the state. Both public income and public expenditure are intrusted to him. He is the business representative of the body politic regarded as an active corporation. The particular form assumed at any time by the political organization is of slight importance so far as fundamental principles are concerned, but it is of great importance when one undertakes to give formal expression to those principles in a scientific treatise. The science of finance is before all else an analysis and classification of those principles of conduct that the financier finds it expedient to put in practice, from which it follows that as a science not only does it borrow character from the nature of political organization, but the scope of its investigation is limited by the practical necessity of making pecuniary provision for the support of that organization, and the relation which it bears to other social sciences is

determined by the manner in which these other sciences affect the amount of money to be raised and the method by which it is raised and expended. I am aware that this is not the philosophical attitude in which the definition of the science of finance and its relation to allied sciences is usually approached, but it is certainly more concrete and has the merit of being easily understood. I shall at least ask your indulgence while developing along this line the subject assigned by the committee. And first let us consider the relation of the science of finance to political economy.

Relation to Political Economy

The most important fact of political organization for one who seeks to define and limit the science of finance is found in its essentially benevolent character. The state as an organization has no personality of interest. A consideration that centers in itself, or a policy that holds in view the power or prosperity of the state apart from the well-being of the individuals who compose it, is bereft of any sound basis of judgment or safe test of propriety; without such judgment and test it is, of course, impossible for a science to exist. The state feels no pleasure in riches nor ambition for wealth except so far as an ample income ministers to the well-being of the people. It is this fact, namely, the benevolent character of the political organization, that gives to the science of finance its peculiar point of view, and what is of more importance for the purpose of this analysis, it is this fact that draws a clear and enduring line between the science of finance and the science of political economy.

It may be well to dwell for a moment upon this distinction, for it carries with it many formal and theoretical conclusions as well as practical results.

The essential weakness of what is known as English political economy consisted in the assumption that material

well-being can be attained only through the agency of a single form of association, that is to say, through voluntary association resting on contract. This assumption is nowhere formally expressed by the writers of the classical school for the reason that its expression would have been superfluous. The establishment of this thesis, and the enactment of laws to secure for the individual the exclusive right of operating within the industrial domain, was the sole purpose of all their analysis and argument. This is not the time to pass in review the line of reasoning which identifies private gain and public welfare, and which seeks to clothe with an ethical philosophy an industrial organization directed by the hope of personal gain. It is sufficient to note that while such a philosophy of industrial relations held sway there was no place for the science of finance as a distinct and independent branch of human knowledge. The course of events has proven the limitations of this philosophy. Its modification covers most of what is important in the development of economics since 1850, and perhaps the most significant of the formal results of this development is found in the universal recognition by modern economists of a science that has to do with the material well-being of the state as well as a science that has to do with the material well-being of the individual, both of which adopt the same ultimate test of a well-organized society.

The relation which the science of finance bears to political economy, the two sciences that together fill the field of economics, may be more clearly suggested by passing in review the formal changes that have taken place in economics since the time of John Stuart Mill, the greatest as well as the latest expositor of the classical school of economy. Mill was too acute a thinker to ignore the existence of the state in a study of industrial organization, but

the philosophy in which he was educated did not permit him to acknowledge the state as a positive factor in industrial organization. It is true that in his *Principles of Political Economy* he considers some of the problems that are now included in the science of finance, but this consideration is introduced in that part of the work which treats of justifiable interference with the normal workings of economic laws.

Manifestly no science of taxation was possible, to say nothing of the science of finance which embraces much beside taxation, as long as the influence of government in industry is regarded as a disturbance of the normal working of natural law; for it is essential to any science that it gives expression to laws that inhere in natural conditions and to principles that are enduring because they are vital to the existence of the subject investigated.

For the correction of this error of the older English economists we are indebted to the economists of Germany, and in Germany the change came rather as a result of the study of jurisprudence and of the application of the historic method of investigation to all kinds of social institutions, than as a formal criticism of individualism in industry. The German economist was educated to the conception of the state as an institution which existed by virtue of the forces that gave it a history. One result of this study of Roman institutions was the idea that the authority of the state rests upon necessity. The material with which he dealt when investigating the industrial life of his own people also obliged him to distinguish between the political and the industrial organization, each with its own principles and its own natural order. It may be true, as some have claimed, that German economists, when treating of the industrial and fiscal character of the state, fall into an error the same in kind as the error of the English classical

economists, in that they subordinate the industrial to the political organization. With that, however, we are not concerned. We are endeavoring to thread our way between public finance and political economy as formal expressions of scientific conclusions, and certainly some help is obtained for this task when we come to understand why German students were able to accomplish what English writers thought it not worth their while to undertake, namely, the development of an independent and self-consistent science of finance and its presentation as one of the many branches of knowledge that have to do with social institutions. The German writer started with a scientific conception of the state; the English writer, on the other hand, notwithstanding the marked success of his people with practical problems of government, had no such conception, nor, indeed, was it possible for him to gain such a conception without confessing the inadequacy of his philosophy of social relations. This he has not yet done in any formal and comprehensive manner, and this is doubtless the explanation of the fact that the English language yet waits for a satisfactory treatise upon the science of finance.

One generalization from the above may not be out of place. Society exists by virtue of two principles of organization which between them divide the field of social relations. These are the principles of voluntary and of coercive association. The former is motived by the proximate interest of the individual and finds expression in contract and agreement; the latter is motived by the welfare of the state and finds expression in fundamental law and legislative enactment. The science of political economy and the science of finance are dealing with the same material, but the former confines itself to the domain of voluntary association and the latter to the domain of coercive

organization. It is doubtless this distinction that led Dr. Adolph Wagner of the University of Berlin—he to whom this paper was first assigned by your committee, and whose absence no one regrets more than myself—to begin his encyclopedic work upon finance with the observation that "the state is the sole depository of coercive power." This fact is the cornerstone of his work, and properly so, for upon it are based the rules by which we are to determine whether a proposition, an argument, or a problem belongs to public finance or to private economics.

Other marks there are that differentiate the field of public finance from the field occupied by political economy, but their mention at the present time is precluded by the necessity of considering the relation of the science of finance to other fields of investigation that touch the interests of society. The responsibility of condensing into a single paper so broad a topic, I am glad to say, rests with the committee in charge of this programme and not with myself. Among the sciences that demand consideration are political science, the science of jurisprudence, and the science of sociology. Each will receive brief consideration.

Relation to Political Science

It is sufficient for our present purpose to know that political science deals with the formal and administrative activities of political organization. It not unfrequently assumes the form of history, but its history is limited by the purpose of understanding administrative forms and of criticising administrative methods. The proximate motive to which judgment is submitted is the same for political science as for the science of finance. Both acknowledge public welfare rather than personal advantage as the appropriate test of all conclusions. It cannot, however, be claimed on this account that political science includes a

consideration of financial problems or the search for financial principles. The distinction between the two fields of investigation is more than a matter of convenience; it touches the fundamental character of the two sciences.

There was a time when the science of finance might properly have been regarded as a branch of, or chapter in, political science, but this is no longer the case. With the recognition of voluntary association as a means of correlating social activities, the financier has been obliged to pay closer attention to the business conditions of private agencies than to the business management of public properties. This is true because he is now obliged to rely rather upon taxation as a source of revenue than upon the possession of public property productively employed. Nor can it be said that the modern tendency of giving to the state the exclusive proprietorship over certain profit-bearing securities tends to relieve the financier from the necessity of administering such industries with a view to the enduring prosperity of private industrial enterprise. Voluntary industrial association is an established institution and the administration of coercive association within the domain of industry, that is to say, the nationalization of public-service industries, must be guided, if not absolutely controlled, by what is required for the perpetuation and success of private enterprises. This means that Kameralwissenschaft, by some regarded as the forerunner of the science of finance, and which might, perhaps, have been properly claimed as a branch of the political science of its day, has passed, never to return. It disappeared with the rise of the institution of private property, and in its place there has appeared the independent and self-consistent science of finance.

At what point, then, do these two fields of investigation touch, and what is the nature of the influence that passes from the one to the other? I shall answer this question from the point of view of finance only.

There are two important lines of influence that political science exercises upon the science of finance, the one formal, the other fundamental in character; the one having to do with procedure, so far as financial legislation and administration are concerned, the other relating to the source from which the financier may hope successfully to obtain revenue.

The question is sometimes asked why the science of finance should include a consideration of budgetary legislation and a chapter upon financial administration, and it is indeed a difficult question to answer. A casual survey of the literature, however, makes it evident that these topics are included along with the topics of taxation, public industries, and public credit, by the financial writers of all nations. The explanation of this is, perhaps, found in the fact that the science of finance is primarily a practical science. It has assumed its modern form very largely as the result of the actual problems presented to the practical financier. The financier is the only public official who, by virtue of his office, is interested in holding legislative appropriations within reasonable bounds. The painful experience of Albert Gallatin, the greatest of American financiers, is ample proof of this assertion. It is natural, therefore, that the financier should emphasize, with all the power at his command, those rules and maxims of legislative procedure which tend to the control of expenditures and which demand from the legislative body due consideration of all appropriations. Whoever feels responsible for public expenditure must, from the very nature of the case, assume a responsibility for the form in which those expenditures are determined and for the manner in which grants of money are expended. Now the science of finance, as already stated, consists in an analysis and classification of those principles of conduct that the financier finds it

expedient to put into practice. It is, therefore, inevitable that the publicist who undertakes to write a comprehensive treatise upon financial problems should devote considerable space to budgetary legislation and financial administration.

This brings us to the question with which we started, namely: What is the formal relation that exists between political science and the science of finance? So far as budgets are concerned, this relation is found in the fact that there is no legislative machinery of which the financier can avail himself to check excessive expenditures except such as is provided by political science. The form of government, the relative power of the legislative and executive branches of government, the nature and extent of public responsibility, and all other similar facts relative to political organization, are *given* factors for the science of finance; but for political science they are the material of investigation and the objects of explanation. Such, as it appears to me, is the formal relation between these two fields of investigation.

The vital relation to which reference has been made is much the same in kind as the formal relation just explained. The financier is not at liberty to choose the sources from which public income is drawn in an arbitrary manner. He is obliged, as he hopes for success, to adjust fiscal machinery to existing industrial, social, and political conditions. The amount of income required by the government raises a question which pertains primarily, if not exclusively, to political science. It is true that many writers within the field of financial investigation enter upon the discussion of the legitimate sphere of government as bearing upon the question of reasonable expenditure, but in so doing they encroach upon the domain of political science. It is for political economy to discuss the problem of gov-

ernmental function from the point of view of industry and for political science to consider it from the point of view of the state; the science of finance should content itself with a consideration of the proper adjustment of fiscal machinery, in view of established industrial and political conditions. It is thus evident that, from the point of view of public expenditures, political science has a very direct bearing upon the science of finance.

Relation to the Science of Jurisprudence

Closely allied to the science of finance is the science which deals with the fundamental rights and duties of persons and of property in organized society. The relation between these two branches of classified knowledge is clear because it is a relation that exists in the nature of the case. As political science outlines the financial programme, so far as the source of public revenue and the organization of public industry are concerned, so judicial science places a limit to the extent to which that programme may be carried when the question of the amount of income to be drawn from one source as compared with other sources is being discussed, and when the principles that control the administration of public industries are under consideration. There is not a state in the American Union that does not in its constitution give expression to the principle that taxes must be equal and universal. Such exemptions from the duty of paying taxes as exist are clearly expressed and rest upon considerations of general policy. Such specific taxes as are allowed also are explicitly named and find their justification in the quasi-public character of the property affected. In other countries than the United States, also, where written constitutions exist, the same legal conditions relative to the exercise of the taxing power may be observed, nor is the situation different in countries where

fundamental law consists in established custom. The foundation of the science of finance is jurisprudence, a statement that is equally true of all the practical sciences that analyze human society in order to learn how it should be administered, and the success of whose administration depends upon the accuracy of their analysis.

So important is this relation in the characterization of the science of finance that an illustration may not be out of place. The illustration I have chosen is pertinent to a current problem, for it shows how hesitation on the part of jurisprudence to recognize a manifest tendency of the time acts as a hindrance to the further development of the science of finance.

The philosophy of human relations may be expressed in the form of rights to which responsibilities are attached, or in the form of duties that carry with them certain privileges, and society at any time takes its color, if not its character, from the degree of emphasis which jurisprudence in practice places upon the one or the other of these two ways of expressing fundamental law. At present we find ourselves at a point in the world's history when the theory of personal rights is paramount, but when, also, the results that are observed to follow from the extreme application of this theory are forcing men to consider whether or not property and privilege should not be a little more heavily weighted with responsibility and duty. This observation is not submitted with a view to its discussion, but as preparatory to an illustration of the curb that is put upon the development of finance by the disinclination of jurisprudence to consider the consequent as well as the precedent.

The theory of property in harmony with the philosophy of personal rights and restricted governmental functions is well expressed by Thiers when he says [in effect] that a

man owns what he makes, and that being its owner he can dispose of it as he sees fit. Upon this assumption respecting the nature of property which may, perhaps, be conceded when confined to primitive industry, the financier has built the general property tax, as it is known to the nineteenth century. This tax may be defined as a tax that accepts value as a homogenous element in property and which imposes a uniform rate on property irrespective of the amount of property held. No matter what injustice may result from the general property tax, it is unfair to hold the financier responsible. The truth is that no other form of taxation is possible as long as the science of jurisprudence asserts the homogeneity of property and distinguishes public property from private property according as its formal title rests in the state or in the private person. The political economist, the financier, and the sociologist have long passed that point in the theoretical development of their respective sciences. Thus the economist acknowledges frankly that quantity, whether it be of goods to consume or of power in production, is measured by curves of intensity; the financier admits that value varies in its personal as well as its social significance according to the purpose and method of its use; while the sociologist has finally succeeded in giving vitality to the conception of organic unity in social relations, from which he concludes that any line of conduct that rests solely upon personal or individual considerations will result disastrously for the individual as well as for the state. But jurisprudence, the oldest as well as the most dignified of all the sciences that deal with human relations, is still confined within the narrow limits of the purely personal conception of private property. Such at least is the impression one receives when he considers the present condition of the science of finance, for he observes many suggestions

for the readjustment of fiscal conditions, and for the development of financial institutions, that must remain unrealized, if not, indeed, unexpressed, until jurisprudence again becomes a living humanistic science. The writings of financiers are replete with condemnations of the general property tax, but that scheme of imposts will continue to exert its baneful influence as long as jurisprudence maintains that equity between individuals demands equal and universal taxation, and this claim will be maintained as long as the institution of private property continues to be defined in the language now common in our courts of law.

This illustration pertains primarily and perhaps exclusively to conditions as they exist in the United States. We need not consider European conditions. What has been said is ample to make clear the relation that exists between the science of finance and the science of jurisprudence. It is a vital relation, not only as limiting and directing the development of fiscal institutions, but in theory also the relation is vital. Even the nomenclature of finance is largely supplied by jurisprudence.

Relation to Sociology

It is not, perhaps, necessary to make a formal statement of the relation of the science of finance to sociology, partly because this latter science is too new and as yet too indefinite to be in possession of a well-defined field of investigation and a compact body of classified information, and partly because the chief service of sociology to the enlargement of human knowledge has been already referred to, namely, the vitalization of the conception of social duty. In a sense the science of finance has always made use of this conception. Considered philosophically, such a conception is inseparable from financial analysis, while on its

administrative side, the science of finance is obliged to assume the fundamental unity of human interests. When, however, the financier came to deal with individuals, partnerships, and corporations under the industrial and juridical conditions of the last half of the nineteenth century, he seems to have lost this sense of social unity, and, as a consequence, much that he said was confused, and much that he did failed to prosper. There was need of a new statement of these fundamental, ethical relations, and it was reserved to that branch of investigation known as sociology to render this service. Without undertaking to trace the rise of the science of sociology we must, I think, admit that the science exists, and that the organic nature of society is its cornerstone. So far as fundamental ideas are concerned, the science of finance is in perfect sympathy with the aim, purpose, and the methods of the science of sociology. It will prove to be of great advantage to students of finance, as well as to practical financiers, that their point of view is thus emphasized by students and workers in yet another field. No difficulty arises with sociology, but when one comes to consider the point of view of many who assume the name of sociologists and who concern themselves with all kinds and sorts of social reforms rather than with the investigation of the social structure and the discovery of social principles, the attitude of the science of finance is decidedly hostile. This is true because the social reformer is determined to make use of fiscal machinery for all kinds and sorts of social ends. It is superfluous to say that such an attitude of mind fails to appreciate the relative values of social interests. It seems scarcely pertinent, however, to follow this suggestion further. The determination of the extent to which fiscal machinery should be directed for secondary ends rests on considerations that lie outside the scope of

this paper. It is likely that the practical result of the relation which at present exists between sociology and the science of finance is that writers of finance will be forced to a clearer and more definite expression of those rules and principles according to which public expenditures are determined and by which the use of the financial organization of the state is limited.

The relation of the science of finance to history and to statistics might perhaps be considered under the title given to this paper, but an analysis of this relation would introduce a point of view quite foreign to that by which it has thus far been characterized. History and statistics are methods of investigation rather than domains of investigation. As methods they are common to all sciences, and for that reason do not call for special treatment.

Conclusion

The impression left by the foregoing analysis must be that the organization of our knowledge relative to human relations is neither arbitrary nor directed by the convenience of the investigator. Each of the sciences passed in review claims for itself a definite field of investigation and rests upon a definite and clearly defined purpose which no writer is at liberty to disregard. It would be as great a mistake in the domain of research to lay undue stress upon any one class of considerations, or upon an analysis of society from any one point of view, as it would be in the domain of administration, to endeavor to solve all public questions and meet all public demands by a single agency. There are two thoughts to which this analysis seems to me to lead. The first is that social sciences cannot with safety be severed from their practical application; and the second is that, as liberty of action is found in the balance of power, so liberty of thought (I mean liberty, not

license) is attained when each investigator in any of the sciences that pertain to human relations recognizes that what he says is true only as it bears harmonious relations to that which other investigators may say.

PRESENT PROBLEMS IN INSURANCE

BY BALTHASAR HENRY MEYER

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PRESENT problems in insurance are both theoretical and practical. In their theoretical aspects they have been treated in the address of my colleague on the relation of insurance to other branches of knowledge. This paper aims to deal chiefly with the more practical aspects of insurance problems in which the policy holder and the public have an interest. The point of view will be the American and only incidentally will references be made to foreign experiences and conditions. Foreign countries offer much that has value for purposes of study, and many an important lesson may be learned from the manner in which the business of insurance has been conducted in other countries and the relations which the various governments have maintained towards this business. Limitations which must obviously be imposed upon this paper make it necessary to confine the discussion primarily to conditions in the United States.

In some respects the problems with which the insurance world has been concerned ever since the institution began

to assume definite form and affect a considerable part of the population, are also the insurance problems of to-day. Numerous transformations and additions have been made since the first struggles of the experimental stage, yet the problem of organization is still before us. The perplexities and diversities of the rise of the agency system have disappeared, but the agency system itself requires the attention of the best minds of the day, with the view of bringing about adjustments more in the interest of the policy-holders and of a sound public policy. The gloom of wholesale failure has been dispelled by the light of sound finance; nevertheless the wild-cat organization still prospers and the organization which makes impossible promises is passing from the scene with painful slowness. Policy contracts have been made more uniform, but the multitudinous details of endless options which are spread before the policy-holder befuddle even the sanest minds. State regulation and supervision have been established the country over. It lies with the future to reduce these many divergent systems of supervision to one uniform and harmonious whole. One branch of insurance after another has been developed, and a number of new ones are at present in an inchoate state. Many more must be added before the entire field has been covered.

These introductory remarks need not be extended to greater length in order to suggest the variety of the problems which exist in the vast field of insurance. Without further preliminaries, attention may be directed towards one of the most important present problems, namely, that of making insurance an all-inclusive institution—all-inclusive with respect to the population insured and all-inclusive regarding the contingencies insured against.

The total number of policies in force in the old line companies has been estimated at nearly 5,000,000, with an average policy of about $2500. The total number of persons

carrying industrial insurance has been estimated at nearly 14,000,000, with an average amount of insurance of $135. The membership of the fraternal societies is nearly 4,500,000. In addition, the insurance features of labor organizations and relief associations must be considered. The total number of persons who carry protection in one or more of these three great groups aggregates nearly 25,000,000. Considering that this estimated number of policyholders includes many duplications, and that industrial insurance statistics include not only the bread-winners but all members of the family, it is obvious that many millions are without the protection of insurance. If insurance is a good thing, if it is in the interest of public and private welfare that the individual should be protected in this manner,—and I assume that it is,—then something should be done to draw into the insurance membership every person who has not won a position of economic independence so far as it is possible within the realm of human action and foresight to be independent. The exempted class is relatively insignificant, and what may constitute the tests of exemption from insurance is of little moment in comparison with the problem of ways and means which must be devised for bringing into the insurance fold the millions who are now recklessly, thoughtlessly, or criminally assuming risks for which they lack both economic and moral qualifications. Men frequently take their lives into their own hands. Sometimes this is courageous; sometimes foolhardy; always hazardous; but nothing can atone for the crime of taking into one's hands the lives of others, unless these hands have the support necessary for the successful performance of those duties upon which the safety of the precious charges depends. Over the greater part of Europe the problem before us has been solved through the establishment of systems of compulsory insurance, much of which is state insur-

ance. The people of the United States have thus far shown little inclination towards an extension of state functions comparable to the functions exercised by European states. Except within certain well-defined limits such an extension may not, at present at least, be in the interest of the population at large, whatever the future may bring and irrespective of contemporary symptoms indicative of a possible change regarding public sentiment upon certain phases of this problem. If it is in the interest of the whole population that every head of a family and every one who aspires to become such should consciously and systematically make provision for the uncertainties of life, then it becomes the function of the state to work for this end, for no arbitrary considerations can limit the functions of the state, which are coextensive with human welfare. While the state cannot say to the citizen, "You must insure in this company, and for such an amount," it can say to him, "You shall insure somewhere, and for a minimum amount". The general welfare clauses of our constitutions provide an adequate foundation for such mandates. Under existing conditions, compulsory insurance would mean insurance in established private companies or companies still to be organized. Most men find ample choice among the many excellent companies. Compulsion implies *all* men, and for those who, for one reason or another, might refuse to take out insurance in an existing company the state would obviously be obliged to provide the facilities for insurance. Admit the principle of compulsion and direct state action must be accepted as its corollary. In other words, compulsory insurance means state insurance for those who refuse to take out the legal minimum in existing institutions. This is compulsory insurance, but not insurance compulsion, which would coerce every eligible citizen into a specific organization. The German law expresses this difference admirably in providing

for *Zwangsversicherung,* but not *Versicherungszwang.* Compulsion is generic, and the limited state action just suggested is specific for that part of the population which requires specific treatment. However divergent men's views may be with respect to the extent of state functions, there can scarcely be much difference of opinion regarding the necessity of some degree of state compulsion if we admit the universality and inclusiveness of the principle of insurance. This necessity exists, and for proof of its existence one may point to the swollen figures of charity and relief societies. There is scarcely a community which has not its poverty-stricken mothers and children left unprotected when the breadwinner was stricken down. Everywhere about us we see the evidences of want and poverty resulting from accidents for which no one may have been directly responsible, but which, nevertheless, cripple and annihilate homes. Whatever the scope of compulsory action may finally be, it must, above all, include accident insurance. As consumers and as taxpayers the vast majority of men will cheerfully contribute their share towards compensating the wage-earner who has become completely or partially incapacitated in consequence of an accident for which no one may be responsible. Where such responsibility exists, employers' liability and laws governing negligence can be invoked.

In view of the many opportunities offered by existing insurance institutions, it is not probable that the state will be compelled to perform the functions of an insurance company to any very great extent. The principle of compulsion, however, will oblige the state to provide insurance for the uninsured residuum, but for no more. Whatever may be required of the state in order to provide for this residuum is fully justified by the important social and economic consequences of this form of state action.

When arguing in favor of more favorable laws governing

taxation, representatives of insurance companies generally allude to the philanthropic element in insurance, because the companies assume a burden which the state would otherwise be called upon to carry in the form of aid and relief for dependents. This argument applies with even greater force to state compulsion and the consequent saving in expenditures for the poor and dependent. Insurance as a preventive and remedial institution cannot be complete without direct action by the state. On a limited scale state action has already been resorted to in municipal insurance of firemen, policemen, and other special classes, and a compulsory law of Maryland has recently been declared unconstitutional.

Without attempting to establish a hierarchy of insurance problems, in which every question shall succeed every other in logical succession and in the order of its relative importance, next to the problem of making insurance an all-inclusive institution may be placed the problem of the better adaptation of the policy to the policy-holder. Jefferson is credited with having said that a fool can put his coat on better than a wise man can do it for him. A first-class agent sees to it that his client selects none but the best-fitting policy; but it is not difficult to demonstrate that for a considerable part of the agency brotherhood it is assumed as a fundamental and determining consideration that the interests of the agent's pocketbook are in absolute harmony with the interests of his client. Hence we find men hopelessly attempting to carry high-priced investment policies, who would be served much better by purely protective policies. If, after a full, accurate, and truthful exposition, a client deliberately selects an ill-fitting policy, the policy-holder must bear the consequences, for no invention has yet eliminated the fool. But when an agent deliberately talks half-truths or falsehoods with a view to influencing a prospective policy-holder in the direction of the agent's purse, the com-

pany which he represents thereby becomes morally responsible for the consequences. Much can be said in favor of establishing legal responsibility in addition to the formal policy contract in all cases where misrepresentations have been made to the client. For illustrations of such misrepresentations one needs only look about in any community of some size. It is probably unjust to express ethical judgments regarding any great number of men taken collectively, and the judgment here indicated does not apply to thousands and thousands of agents. It does apply to others, and a greater feeling of responsibility, leading to proper official action on the part of the administrative authorities of companies, will do much towards purging the insurance fraternity of this harmful element.

An unmistakable indication of the necessity of insisting upon the better adaptation of the policy to the policy-holder is found in the widespread and deep-seated demand for "cheaper insurance." Inquiries among agents who keep in touch with the masses of the common people elicit the reply that this demand is emphatic and imperative. By cheaper insurance these people do not mean insecure insurance, which is no insurance, but insurance which will afford them the greatest protection at the least cost. No reference is made here to so-called insurance or protection which lacks the scientific foundation of all insurance. The cry for cheaper insurance, which is most emphatic during periods of depression, emanates in part from a reaction against the excesses of so-called investment insurance. There exists a great demand for investment insurance, but the demand for pure protection is greater and includes larger numbers of the population. There is no occasion for quarreling with the man who advocates investment insurance and the man who wants to buy it. Each individual may well be left to the dictates of his own judgment with reference to the question.

If he prefers to enter into a contract with an insurance company for the care of his funds, there is no reason why he should not be permitted to do so. It is essential, however, that the investment feature of insurance should remain differentiated from the purely protective element, lest the branch ruin the tree. Protection is the institution; investment is an incident of its administration. The incident should not be permitted to obscure the institution.

In further proof of the popular demand for cheaper insurance and for insurance at retail, the marvelous growth of industrial insurance and the enormous expansion of the fraternal system may be cited. The industrial companies abandoned the struggle of three dogs over one bone and pushed out into new fields where there were many bones and no dogs. Industrial insurance extended the fields of protection into the ranks of the humbler but highly self-respecting and respectable classes. The methods of industrial insurance in collecting small premiums at brief intervals are expensive and wasteful. The army of house-to-house solicitors and collectors must be clothed and fed. But we cannot suddenly unmake the character and habits of mankind. Present methods of industrial insurance are adapted to human nature and the existing state of society. Insurance methods and conditions of society may change together, and with the lapse of time improved methods may exert an increasing beneficial influence upon the attitude of society toward insurance.

Regarding the gains in membership of fraternal societies, the reports of insurance commissioners show that in many parts of this country these gains exceed the gains made by old line life companies. In part, the gains in fraternal membership are doubtless the result of natural growth and the more or less artificial multiplication of orders; in part, they are probably due to the wholesome reforms which many

of these societies have instituted; but to a large extent these gains must probably be attributed to the appeal to prospective members, successfully made, as the figures show, that old line insurance is too expensive and that fraternal insurance meets the needs of the man in moderate circumstances. No opinion is here expressed relative to the merits of this appeal. The fact of this appeal, however, must be observed. This fact carries with it a note of warning to the old line companies that they may not lose sight of the great central idea of pure protection; and to the fraternal orders that they may be prepared to assume and faithfully discharge the duties which they have assumed and are desirous of assuming. It is a matter of common knowledge that scores of fraternal orders are to-day openly and persistently violating the most elementary principles of protection. To bring about changes in legislation which shall compel every fraternal order to observe and rigidly obey these elementary principles is one of the greatest problems in the insurance world of to-day. The spectacle of conventions to determine rates of premium and mortality tables by popular vote is as absurd as a popular vote to determine the latitude and longitude of the magnetic pole. It is more than absurd; it is criminal. A popular vote on the location of the magnetic pole is simply nonsense, and science continues to advance in spite of the nonsense. A popular vote for the formulation of mathematical principles upon the accuracy of which the welfare of millions of our population may depend is arrogant ignorance deserving of the penitentiary. To continue to solicit membership at rates which have been condemned by competent authority is at least as culpable, if not worse, than to receive deposits in a bank after the same is known to be insolvent. And the latter has long been a criminal offense. Some fraternal orders have employed competent actuaries; a small number have fol-

lowed the advice given by these actuaries; but great numbers of them are still marching on to certain ruin under the impulse of morbid appeals to brotherly love and sentimental twaddle about philanthropy. Everything that has been said thus far regarding fraternal societies is meant to apply only to that portion of the fraternal system which offers definite sums of money to beneficiaries on the occurrence of certain contingencies in return for contributions made irrespective of the terms which the various societies may employ in designating these features of their system. In other words, these remarks apply exclusively to fraternal orders which are also insurance companies, and which no amount of sophistry can make anything else. No reference is made to that other portion of the fraternal world which practices genuine benevolence and brotherly love, and which expends millions of dollars annually in charitable and relief work, but which does not do an insurance business. A root and branch reform of some kind is needed for the first-named class of societies. Possibly a system of voluntary registration similar to that which eventually effected a rejuvenation of British Friendly Societies may be expedient, provided it is distinctly understood that unregistered societies are of uncertain merit. Much can even be said in favor of compulsory registration, provided a reasonable length of time is given to the unsound societies in which to do their housecleaning. Many leaders among the fraternal orders have recognized the urgency of reform, in evidence of which the proceedings of the fraternal congresses may be offered. In fact, the volume of proceedings of the last congress stands in strong contrast to a similar volume of ten or fifteen years ago in the abundant evidences of a vigorous reform movement. But the organization of the societies is such that reforms are unusually difficult in their execution, and a single effective stroke of the law would suggest itself as the most

feasible and certain method of ending a great public wrong. Granting a thorough reform of this phase of the fraternal system, its future prospects appear to be unlimited. Mutuality, self-help, rigid economy, thorough democracy, personal sympathy, genuine protection, are all in the interest of public and private welfare.

The question of mortality experience and rates is not confined exclusively to fraternal societies. On the other hand, some of the criticisms passed by fraternal societies upon the old standard mortality tables can be shown to be partially just by the published experiences of the companies and the studies of actuarial societies. During the year 1903, for instance, the companies doing business in Wisconsin saved approximately $18,000,000 out of an expected mortality charge of over $102,000,000, while on three and one half millions of expected annuities they lost $175,000. These facts show that the assumed mortality was much higher than the actual rate of mortality. Whether this margin of approximately 20 per cent is necessary in the interests of safety must be left to the actuaries. There are those who believe that so wide a margin is not necessary; and if the fraternal societies, by means of the homogeneity of their membership and the care of selection, can effect much more favorable experiences, so much the better for them. Great credit is due to the Actuarial Society of America for conducting the mortality investigation designed to show the actual risks incurred, on the basis of the past experience of the companies included in the investigation, in case of certain classes of policy-holders. This investigation has not only contributed to the greater accuracy of mortality statistics, but it has emphasized the relative degrees of healthfulness of certain employments, occupations, and habits of life, and thus it may exert a powerful influence upon the conditions under which men live and do their work. The

investigation suggests the possibility of separate mortality tables for each important occupation, profession, or trade, with corresponding differences in the rates of premium charges, although the practical difficulties involved in the administration of the various classes may be insuperable. Perhaps this question should be excluded entirely from the scope of the present paper and consigned to the borderland between insurance and speculative philosophy. Equality of treatment among policy-holders cannot exist where men live under widely different sanitary and industrial conditions. It is in the interests of correct habits of life and wholesome surroundings that a special mortality rate be established for the greatest possible number of classes. It will then also be easier to deal equitably and intelligently with the problems of the sub-standard and special risks, and the insurance of women. All these classes must be dealt with if insurance is to become, as it seems it should, an all-inclusive institution.

The inequality among policy-holders due to different habits of life and conditions of employment suggests another source of inequality, namely, the inequalities in the proportion of the total risks assumed and benefits received arising from the different amounts of insurance carried by policy-holders in the same company. A single risk of a hundred thousand dollars is a very different thing from one hundred risks of one thousand dollars each. It has been ascertained that there are forty persons in the United States who carry more than $500,000 of insurance. A company composed exclusively of policy-holders who carry, say, $500,000 each, if large enough to enable the law of average to operate, would be perfectly equitable and safe. But no one will claim that forty is a number sufficiently large for the application of the law of average. Since these forty are scattered among different companies, the inequalities re-

sulting from such abnormally large policies become even greater. Most companies have established a maximum which they will not exceed in case of a single life. These maxima range from $10,000 up, $25,000 and $50,000 being most common. The heavy policies are bound to operate to the disadvantage of the smaller policies in the same company unless the rate of mortality among large policy-holders is proportionately more favorable than the average, nevertheless an insurance man who attempts to convince a client that his company possesses superior merits on the ground that it has a number of heavy policy-holders stands on ground as dangerous as that of the fraternal society which, in a published circular, maintained that the death of a brother soon after his admission increased the financial strength of the society, because, under the rules of the society, this death led to the transfer of a certain sum to the emergency fund; while if the brother had lived and paid his contributions a much smaller sum would have been thus transferred! Theoretically, equality can exist only when the policies are all of the same size and the mortality experience is the same for all age classes. This exact equality is obviously impossible, and great numbers tend to rectify the errors as applied to individual cases. Different men want different kinds of policies in varying amounts. Where the variations are not excessive a practical and substantial equality is achieved. Where policy amounts are highly disproportionate, inequality and absolute injustice must follow. Attempts have been made to justify the large policy in a company composed overwhelmingly of small policy-holders. The multiplication-table rests upon neither conviction nor opinion.

It is an axiom of insurance that the assumed rate of mortality must be greater than the rate experienced by the companies; that the interest earned must exceed the rate as-

sumed, and that the loading, or allowance for expenses, must be greater than the actual expenses. The last member of this tripod can no longer take rank among axioms, for although the companies have been struggling to keep down the expense rate, the cost of conducting the business has in many instances exceeded the loading for expenses. In case of the life companies doing business in Wisconsin, according to the published report of the commissioner of insurance, this excess amounted to over seven and one-half millions of dollars out of a total expenditure of over one hundred and fifteen million dollars during 1903. This means either that the original allowance for expenses on the part of the thirty-six companies which exceeded their loading was inadequate or that the expense rate has become excessive. If the loading was sufficient in the first place, the additional funds required in conducting the business must have been secured from other sources. Chief among these possible sources are the savings from mortality and gains in interest on investments. Both of these sources create funds which belong to the policy-holders, and their use for excessive and unnecessary expenses is a misappropriation of trust funds. The problem of the disposition of the surplus has been thoroughly discussed in a well-known insurance case still pending in the courts. It is asserted that under present methods the companies are not held to a rigid accountability regarding surplus funds, and that the accumulation of great surpluses for long periods of time is the chief, if not the sole, cause of all the evils which exist in the life insurance business. Without affirming or denying the validity of these assertions, there can be no reasonable differences of opinion concerning the desirability of a rigid accounting for every dollar held in trust for the policy-holders as a part of the surplus to be distributed during subsequent years. There are various types of policies providing for the accumulation

of funds in the hands of the company for the benefit of the policy-holder or his beneficiaries. Policies generally provide for the distribution of these funds at the termination of specified periods of time. According to some, these periods of time should be short, say, one year; or, at least not to exceed three or five years. The representatives of this line of thought are opposed to every scheme of surplus distribution which projects the distributing period five, ten, twenty or more years into the future. Their opponents ardently defend long-term distribution periods. The practice of some companies furnishes a satisfactory middle ground between these extremes. Instead of distributing surplus funds annually or once in three or five years, they keep a careful account of the surplus earnings of every deferred dividend or analogous policy, usually apportioned on the contribution plan, and then make a single payment to the policy-holder at the termination of the period. Each policy-holder knows from year to year what his share in the surplus is; hence no amount of future extravagence or mismanagement can deprive him of this money. The company is not tempted to use the funds thus assigned to policies in paying excessive commissions or doing other doubtful things, because this practice would be detected. If a man desires to employ an insurance company to accumulate a single sum at a future date from many small contributions, there is no reason why he should not do so. On the other hand, every consideration of good public policy demands a rigid accountability on the part of the companies. The plea that the accounting required under such a method is impossible for a great company may be met by the statement of fact that some great companies have been doing this very thing for many years. Strong arguments can be advanced in favor of short periods for the distribution of the surplus; but with proper restrictions the long period plans offer ad-

vantages which the short ones do not possess. The arguments are not all on one side.

Little unanimity of opinion exists regarding the equities of policy-holders in the reserve and accumulated surplus in case of lapse or a surrender of the policy. The early hard custom of absolute forfeiture has gradually given away to more liberal privileges; and, to-day, there are not wanting those who advocate perfect freedom of withdrawal and surrender. Where the policy is a contract of pure and mutual protection, the withdrawal of a policy-holder theoretically weakens the bonds which support the whole, and to this extent it appears to be in the interest of all the policy-holders to impose a moderate fine or surrender charge upon the defaulting member. The well-known argument of adverse selection or the withdrawal of the better risks with its concomitants is generally applied at this point. Where the policy, however, is a protective contract coupled with endowment or other investment features, a different treatment of the surrendered or lapsed policy is demanded, it being assumed in this discussion and taken for granted that any extra expense incurred by the defaulting member on the part of the company be charged to his policy. An examination of the columns of statistics headed "Lapse or Surrender Values" shows conclusively that many companies levy fines on the surrender of so-called investment policies which have no more justification than if a bank were to levy a fine upon the withdrawal of deposits. In fact, deferred dividend and similar funds are very much in the nature of bank deposits, and to fine the withdrawal of the one is as unjust as to make a special charge for the reclamation of the other. The justice and expediency of a reasonable surrender charge may be admitted for the reasons usually stated in support of such charges, reasons which, it should be remembered, are discredited by competent men who take

a different view of the question, without sanctioning a practice of mulcting depositors which rests upon nothing but the arbitrary dictates of an insurance company and the extravagance of bad administrative system. It is no justification of this system to say that the companies have been struggling with agency, publication, and other reforms, which have been considered many times. This abuse exists, and it will continue to exist until policy-holders rise against it and the attendant evils which it directly supports.

At various intervals in the history of company development in the United States attempts have been made to secure for a single company the legal privilege of engaging in a variety of enterprises. Within recent years this tendency has been, perhaps, the dominating one, and companies with *omnibus* powers are numerous in the industrial field. Among the companies which are devoted to the newer branches of insurance, such as fidelity, casualty, plate-glass, tornado, and other relatively recent developments, there are those which attempt to do two or more kinds of business under the same charter and over the names of the same set of officers. It is conceivable that the same set of men may be able to undertake successfully different branches of insurance at the same time. It has been done. If it is to be continued in the future, good public policy, as well as the best interests of the insured, demands that the different branches of the business shall be managed by different companies, operating under separate charters, each legally restricted to one branch of the business, each responsible to the proper supervisory authorities, and each absolutely independent as a financial institution. This point should commend itself to the legislatures of the various states in which new charters are sought. On the part of the older insurance companies the mixing of functions on the basis of express charter provisions practically does not exist. Because

of their enormous financial transactions these companies have, however, become to some extent affiliated with institutions organized for other than insurance purposes. Business affiliations of this nature are extremely common in the industrial world and constitute one of the distinct characteristics of modern economic development. When such affiliations of insurance companies arise naturally out of the necessity of investing great sums of money in the most profitable manner, consistent with security, and extend no farther, no valid criticisms can be raised against them. When, however, these affiliations of insurance companies become tantamount to the assumption of banking, transportation, manufacturing, or other powers, the interests of policy-holders as well as public morality demand a peremptory abrogation of such powers and a complete separation of the affiliated institutions. By adding the columns in Wolfe's *Investment Directory of Insurance Companies for 1904*, any one may ascertain that the insurance companies listed in the *Directory* own a total of about $21,000,000 par value of preferred, and $81,500,000 par value of common railway stock. They also own nearly $26,500,000 par value of miscellaneous industrial stocks, of which nearly $6,000,000 par value are preferred, and over $20,000,000 common. Disregarding that part of the holdings of preferred shares which represents voting-powers, the exact extent of which cannot be readily determined, the common shares represent 100,000 votes, assuming that all are $100 shares, in the election of officers and directorates of railway and industrial companies. To this extent the insurance companies concerned operate railway and manufacturing establishments. That this power is actually exercised, and occasionally with czar-like authority, can be easily confirmed by a visit to Wall Street. It may be argued that, having invested their funds in stocks carrying a franchise power, the insurance

companies must participate in the management of the establishments represented by the shares held by them in order to protect their own interests through the appointment of competent officials. It is a sufficient and final answer to say that no insurance company has a right to touch the shares of a company which requires the wisdom and experience of the insurance officials for its safe conduct. Shares of stock issued by a company with the least taint of a suspicion of incompetent or dishonest management condemn themselves as investments for insurance trust funds. There is positive, direct, and immediate danger in unrestricted insurance investments in the common shares of railway and industrial companies. Preferred shares may be as good as bonds or as certain as inferior common shares, depending upon the particulars of the case. It should be added, however, that the moderate market fluctuations of shares, unless the shares were purchased at too high a price, do not necessarily constitute valid objections to the investments in such shares, because the insurance company is interested not only in the security of the principal, but also in the certainty and continuity of the interest or dividends, and the rate of interest earned is not necessarily affected by moderate variations in the market price of securities. Investments in railway and other first-class bonds do not offer the objections inherent in investments in stocks for the reason that bondholders do not generally have anything to do with the mangement of the properties upon which the bonds are issued. The quiet influences which large bondholders may exert can scarcely be made the object of unfavorable criticism from the point of view of the policy-holder.

Before dismissing the question of the affiliation of insurance companies with other kinds of business, it is desired to direct attention towards the use of names in connection with some insurance companies, notably some of the newer

or weaker companies. It is well known in insurance circles that men will permit companies to use their names as officers and directors when the man who carries that name may be absolutely ignorant of both the nature of the insurance business and of the standing of the company which the public is made to believe he directs. Long lists of "advisers" and "councilors" who, in a quiet way, become interested in the company on some "ground-floor plan" are published and scattered broadcast with the view of securing as policy-holders persons who will be influenced by the fact that certain names appear in the list of officers, councilors, or advisers. Sometimes these decorative persons are promised financial rewards, abstracted as robber-tolls from the premium payments of more honest policy-holders. All this wretched business is too contemptible to deserve more attention in this place beyond the exhortation that every citizen should do his utmost to secure legislation which will forever banish the dishonest insurance prospectus and the dishonest use of names in connection with the insurance business. Existing legislation is inadequate to accomplish this. Legislation is not regarded as a cure-all, but within limits it can direct, shape, turn, encourage, or prevent. It can preserve and promote public interests where competition and self-interest, even in their enlightened form, tend to produce undesirable results.

Indeed, a survey of the insurance laws of to-day offers a variety of suggestions. The taxation of the companies rests upon no uniform rule of administration or principle of taxation. Inequalities, anomalies, and absurdities are everywhere apparent. The barbarity of reciprocal laws continues without abatement. The diversities in state legislation and the duplications and repetitions involved in state supervision needlessly harass the companies and drain their resources. Every analysis of the situation, undertaken

from whichever point of view, points toward the great advantages of a single, fundamental federal code of insurance laws. This applies especially to taxation and supervision. The insurance business is overwhelmingly an interstate business. It is by its very nature subject to a great deal of publicity. It is a centralized business and, therefore, it is relatively easy for a federal authority to supervise it. No convincing arguments have yet been presented against a system of federal supervision. A federal authority could prescribe uniform reports and uniform rules concerning the general administration of the business. Possibly there are some points which could be left to the states. That is a matter of detail which can doubtless be adjusted without difficulty when the time comes. A single examination of a company would then authorize it to do business in every state. At present a company may be compelled to submit to the inconveniences and expense of a number of examinations. The expense of a single examination, according to authentic figures, may exceed $50,000. This is the highest figure known to the writer. Possibly other examinations have cost more. A repetition of such examinations must affect the earnings on policies. Even though this should not be the case to any appreciable extent, the system of charging the cost of an examination to the companies is wrong in principle and has been condemned by scores of state insurance commissioners. Federal legislation would remedy the evil.

Federal legislation, by instituting a single supervisory authority, would also make it possible to exercise a more intelligent control over the policy contract. Under a system of multiple state supervision this would be entirely impracticable. The language of the policy contract is frequently involved and usually "composite." A simple form of contract, which any intelligent man may understand, is desir-

able. If, now, every form of contract were made subject to the approval of a competent supervisory authority, many of the absurdities and unnecessary complications in present contracts would disappear. A specimen of every contract-form issued should be deposited with the supervising office, and every contract departing from the recorded and deposited types declared illegal. This is not an argument in favor of absolute uniformity among the companies, which would be undesirable in that it would deprive society of the benefits which come from individual initiative and invention. The competition of the companies in the attractiveness of their policy provisions is one of the most valuable features of the rivalry which has been keen for many years. Rivalry in benefits bestowed upon policy-holders and in economy of management brings advantages to society. The suggestion here made has for its purpose simply the elimination of objectionable features in policy contracts. It is a difficult, delicate, but not impossible task, and, with adequate provisions for appeal, entirely safe.

Turning now towards the great field of fire insurance, upon which so much of modern business rests the most characteristic feature of recent development is the rapid extension of the use of schedules in rating risks, and the establishment of fire insurance exchanges. Not very many years ago fire insurance was accurately described as a magnificent system of guesswork. The schedule has reduced the guessing element by furnishing a basis for the classification of risks and the determination of rates, which can be made intelligible to men of average understanding. Existing schedules have laid the foundation for the classification of risks which may lead to the establishment of loss ratios for certain classes of property, similar to mortality statistics for different classes of the population. The establishment of average losses for different classes of property, such as

planing-mills, breweries, foundries, warehouses, etc., is one of the most important problems of to-day. Since not every building must be destroyed, even partially, fire insurance tables of losses can never reach the degree of accuracy possessed by mortality statistics. Nor is this necessary. But up to very recent times the problem of scientific rating has received relatively little attention. Each building was regarded as a unit by itself, and a rate fixed for it in a haphazard manner. The schedule introduced a standard by which to judge the merits of different types of buildings, contents, appliances, etc. The schedule places a premium on high-class construction, good management, efficient fire protection, and thorough inspection. The value of rigid compliance with established standards is amply demonstrated by the remarkable record of the New England manufacturers' mutual fire insurance companies. By establishing and maintaining an insurance engineering station these companies are doing a most necessary and highly valuable work in applying scientific methods by which the entire fire insurance world may profit. The fire insurance exchanges have aroused some opposition, and very recently action has been brought against one of them on the ground that it is a conspiracy in restraint of trade. I regard the exchanges as one of the most valuable and indispensable developments connected with fire insurance. They are compilers of information. They work for uniformity in the inspection of risks, in rating, in building regulations, and in every other department of the work. The exchanges might well be intrusted with the establishment of net rates, leaving it to the individual companies to compete in economy of management and in the care with which their risks are selected and inspected. The establishment of rates by an exchange is likely to arouse hostility on the ground that the exchange is a combination formed for the purpose of exacting ex-

cessive rates from the public. This is an old cry. That the danger exists is obvious. That it can be prevented is not open to reasonable doubt. The exchanges merit full legal recognition with safeguards against the abuse of the powers which they may exercise. An atomistic fire insurance world can bring advantages to no one, and it is likely seriously to prevent progress. The abolition of the exchanges would remove one of the most potent factors making for scientific methods, and it is to be hoped that no such drastic measures will be resorted to anywhere in the United States. I cannot leave the subject of fire insurance without protesting once more against valued policy legislation, because it is an encouragement to crime and subversive of private and public morality. It is no more profitable to enter into hysterics over "insurance and crime" than over "theology and crime," but the valued policy law is in itself objectionable from every point of view.

In conclusion, a few words must be devoted to those branches of insurance which are still in an inchoate state and which were referred to in an earlier paragraph of this paper, in connection with the suggestion to make insurance an all-inclusive institution concerning the contingencies covered. The urgent need of dealing fully with the problem of accident insurance has already been pointed out. Insurance against losses from flood, tornadoes, hail, and other destructive agencies is in the interest of society as a whole. In view of the fact that these causes of loss do not appear with known regularity nor within well-defined territorial limits, the question arises whether this form of insurance may properly be left to the government. Studies have been made of the destructiveness of floods and tornadoes which might be used as the basis for the imposition of a tornado or flood tax. The levees on the Mississippi were built partly through federal aid, partly through levee district taxes,

and partly through state taxes. The same principle might be applied to the collection of flood, tornado, and hail taxes. These branches of insurance do not appear to offer suitable fields for private endeavor, and conservative state action is well adapted to meet their peculiarities. Within the last year companies have been organized to insure losses resulting from strikes. Insurance against loss of employment has also been considered to a limited extent; but in this, as in so many other special forms of insurance, we have not even made a respectable beginning, and the attempts which have been made in foreign countries may be studied by Americans to great advantage. Because of the peculiar character of the contingencies to be insured against, the last-named branches of insurance represent difficulties which are unknown in life or even fire insurance.

In the concluding sentence the writer desires to remind his audience that he has written as a layman from a layman's point of view. The professional insurance man, who is responsible for the success or failure of his business, must decide to what extent a layman's judgment can find practical application.

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(*Prepared through courtesy of Professor Edward D. Jones.*)

NOTE.—There is no systematic or book literature in English covering the ground of this paper. The printed sources of information are trade-papers, the addresses and proceedings of conventions of business men, public documents, periodical economic publications, the popular magazines, the annual reports of corporations, etc. It is therefore practically impossible to give a bibliography which will be available except in a few of the larger libraries of the United States which specialize in the collection of current industrial and commercial literature.

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THE PROBLEMS OF COLONIAL ADMINISTRATION

BY PAUL S. REINSCH

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FUTURE students of political evolution will note a strange similarity between the theories which are now being advanced to defend imperialistic expansion and that humanitarian optimism which animated the period of the French Revolution. The ideas through which the French Revolution attempted to conquer the world were based upon an intense and undoubting belief in the equality and uniform virtue of human nature. Freed from the shackles which perverted forms of society had formed, humanity would again be true to itself, would follow its rational impulses, and under sane institutions, inherit a millennium of peace and happiness. These hopes of the young century were bitterly disappointed in its later years. It became impossible to realize the unity of civilized mankind, and the narrower feelings of nationalism and race antipathy took the place of the earlier enthusiasms. But at present, when a new and universal forward movement of civilized society is taking place, the same ideals are again appealed to. Humanity is one, and the members of the brotherhood who through barbarous customs and irrational institutions are kept in a state of backwardness are to be led out into the light of freedom and reason and endowed with the multi-

form blessings of civilization. Many of the races embraced in this ideal love are as little inclined to accept the dispensations of a human providence as were the European nations who resisted the spread of revolutionary ideas as interpreted by Napoleon. Their resistance may, however, turn out to be less formidable, and so the course of history may not repeat itself. The experiment may be more successful this time than it was before, and a new era may actually be dawning upon the outlying regions of the world.

But if this forecast is to come true, it will be due primarily not to the general ideas to which we have just referred, but to certain great economic changes which have taken place during the last century and which have laid a material foundation for a world-wide organization of social life. The movement began a few centuries ago with the creation of commercial stations along the coasts of distant continents. The basis of intercourse was then frankly commercial. There was no attempt to interfere with the interior social and political arrangements of the native races, and only in India, where the British were spurred onward in the course of empire by the ambitions of the French conquerors, and in the Dutch possessions and other plantation colonies, which were looked upon as estates waiting exploitation, was there any penetration of the interior regions. But after the middle of the last century, the great advance made in the rapidity and ease of communication revolutionized the entire movement of colonial activity. Being brought so much nearer to the European countries, the undeveloped regions in general became looked upon as promising fields for the investment of capital in the extractive and agricultural industries. This implied a far different relation to internal affairs than had obtained before. While the merchant was satisfied with small trading-stations or river-hulks, the colonial *entrepreneur* looked to the interior regions for an in-

FILIPINOS AT THEIR OCCUPATIONS.

The Carabao, or Water Buffalo, is the most used beast of burden in the Philippines, taking the place of both horses and oxen. It is not a hardy animal, is slow of movement, and is easily fatigued, but against these objections may be placed its superior usefulness in cultivating the plains such as rice fields, for in habits it is almost amphibious. Besides being used for draught purposes, the Carabao is ridden by Filipino farmers as we ride horses in America.

Moro women, as seen in the photogravure, are industrious weavers and manufacture, in a primitive way, very beautiful cloths from the leaves of the pineapple. By scraping with a sharp instrument a fine filament is produced that closely resembles silk, and which, when woven into a delicate cloth, called Pina, commands a high price. A cloth almost equal in texture and value to that produced from pineapple leaves is made from the leaves of the agave, or century plant.

vestment of his capital. It was essential to him that these regions should be made accessible, and that within them law and orderly conditions should be established; that a steady labor-supply should be provided, and that so far as possible the mechanism of Western industrial life should be introduced. The inevitable result of such changes was the demand for political sovereignty over extensive tracts of territory. The struggle for colonial possessions commenced, and with great rapidity Africa was divided among the colonizing nations, while preëmption rights were claimed in other unoccupied regions. Having thus forcibly seized upon large tracts of land and established a claim of sovereignty over their inhabitants, the nations engaged in this movement looked for some moral principle upon which this procedure could be defended. At this juncture it was very natural to fall back upon the earlier theories of the unity of mankind and of the destiny of rational civilization to embrace the entire globe. The missionary spirit was evoked, the duties of the civilized nations towards the less fortunate were unfolded, and the whole movement was represented as one of altruism and benevolence.

This intermixture of economic forces and idealistic moral impulses has brought great confusion into the entire political thought of our period. So chaotic is its condition that many minds have despaired of discovering in the entire movement of expansion any vestige of the moral sense. They are ready to stamp the entire idealistic theory as pure cant, consciously designed to veil a most selfish type of aggression. They point out that while we preach the doctrine of universal brotherly love, we look with disdain upon nations, no matter how highly civilized, who differ from us in the least shade of color; we abolish slavery, and under the pretext of providing a moral education for the natives, introduce forced labor; we preach peace while

we are stirring up into warlike feelings societies that for ages have lived in a condition of peacefulness; we cry for the open door, meanwhile plotting all the time to reserve to ourselves the markets over which we can exercise any control; and while our science has made the idea of evolution an ingrained part of our being, we carve up the world into artificial tracts and attempt to impose upon the natives an alien system of social institutions. Such contradictions invite the suspicion that we have here to do with a vast aggressive movement of national selfishness, which is simply paying a bare and empty respect to ideas of morality which in practice are totally disregarded. And yet such a conclusion would hardly be just. In the complex system of thought which directs the action of our time, the enthusiasm for the ends and purposes of civilization is more than a mere veil of selfishness; but it remains to be determined how this idea can have any effectual influence in the constructive work of colonial administration.

Like strong personalities, the modern nations are filled with a desire to impress the mark of their genius upon the world. While there are many ways in which this may be done, one of the most obvious is that of gaining followers for their ideas of life and civilization. Nations desire wealth, and expand their trade; they desire prowess; they create great industries and maintain powerful navies and armies; but in their heart of hearts there can be no truer gratification than that of hearing their language spoken in a strange land, than having their customs and institutions acknowledged as superior by other races. This leads to the conception—surely not ignoble—that the area of civilization is expanding, and that by the patient efforts of centuries one nation after another will be raised to a higher level of social efficiency and allowed a greater share of social happiness. As from the small altar of civilization

in Greece the torches were carried to the east and west, even by the armies of Alexander and Cæsar, the imperialists hope that this same heritage, enriched by the achievements of many intervening centuries, will henceforth be spread throughout the globe through the peaceful means of economic development, supported only when absolutely necessary by the arm of force. But we have already seen how unsafe a guide an ideological conception like this will ever be. In order that it should become useful, we must avoid the danger of a vagueness which would include all manifestations of expansive energy under its mantle of approval. We must analyze the forces at work in order to determine which of them are really in accordance with the aims and the character of civilization. We must inquire what our civilization demands, and what constructive elements in a colonial policy may be judged to flow from its character and essence. Our own civilization is the only criterion we can apply, because, while we may despair of being able to bestow its outward blessings upon alien races, we must, in our relations with them, be governed by the inherent laws of our own rational nature. An attempt to act otherwise would imply a claim to the wisdom of providence in ordering the destinies of alien races. But we are on safer grounds when we conclude that we are entitled to do what is natural to our own civilization and what its character demands, and as long as we do not depart from its principles in our intercourse with other races, we shall not have to reproach ourselves, at any rate, with having deserted the only clear guide we have.

Colonial expansion must first be judged from the point of the needs of our own civilization. To what extent is it a normal result of those forces which constitute the civilization of the West? The conception that the whole movement is undertaken in an unselfish spirit in order to

help the less fortunate races cannot be seriously considered. Nations that have so many unsolved problems at home would be stultifying themselves by trying to straighten out the difficulties of others. Unless a vital need of our own civilization for this very expansion and interference with other races can be shown, it cannot claim any justification on humanitarian grounds, because we have no way of proving that our interference with others will be necessarily beneficial to them. When we inquire what are the truly essential characteristics of our civilization which distinguish it from all others, we shall perhaps find in the last analysis that they are mobility, concentration, and mastery over the forces of nature. In no other society are the individual members so independent, so able to move within the social body, to determine their own development, and to bring their energies to bear in a variety of places and manners. No other society has so high a concentration of individual forces or social ends. No other society has achieved so complete a mastery over the productive and impellent forces of nature. Out of these charcateristics the expansion movement has naturally developed. It was impossible to restrict the mobility of social forces to national boundaries. Passing beyond, they for a time escaped social control, and the action of the individual adventurers by no means always redounded to the credit of civilization. It was found necessary to follow them up and to bring social conscience and control to bear upon them in the new regions which they had penetrated. The principle of concentration naturally led to the demand that the new regions whose resources were being opened up should be brought into close relations with the national industrial life to which they are subsidiary. Finally, the great problems of the control and utilization of the vast productive forces of the new continents invited the ability

trained in the narrower European field to prove its mettle in coping with greater difficulties.

It has been urged that since the characteristic mark of modern economic life is the intensiveness of its methods, the attempt to spread economic effort over larger areas would necessarily mean the return to the barbarian system of exploitation. According to this view we have to choose between the constantly more productive intensive culture of a smaller territory and the extensive exploitation of ever-widening areas. A real danger is here pointed out. If, on account of the rapid and easy profits gained through a reckless exploitation of the natural wealth of new regions, our capital should neglect the steady intensive improvement of industry at home, a marked retrogression would soon set in. Our industrial supremacy would be threatened and our social life corrupted, on the one hand by a degeneration of industries at home, on the other hand by a wealth too easily gained and by the consequent rigid stratification of society. The lesson to be drawn from this objection, therefore, is that by all means reckless exploitation in the new countries is to be made impossible, not only in order to protect the inhabitants of these regions, but also to prevent a very dangerous reaction upon our own industrial and social life. But if a sane and rational policy of economic development should be followed, it is difficult to see why it is not justifiable to extend intensive methods to wider areas, and to introduce a productive economy into regions where at the present time barbarian exploitation alone holds sway. It has also been urged that the present movement only emphasizes the nervous restlessness of Western civilization. We have given, it is said, too much attention to means, too little to the ends of life, and in the great movement that we are now undertaking, we are striving simply for new means, we are erecting a vast mech-

anism which will embrace the entire world and crush it in a dreary uniformity. What result are we aiming at in the construction of this vast machine? Who is to be happier for it? How can it conceivably increase our happiness or the happiness of the native populations who are turned from their natural mode of existence, and forced to adopt a new and irksome way of life? Questions like this are too general in their reach to admit of a conclusive answer. We may grant that our civilization is lacking in definiteness of aim, that its general tendencies are confused and uncertain; but may it not be that in the contact with the older civilizations of the Orient, it will be led to a new interpretation of life? Such would seem to be the natural outcome. When once the world has been organized as a system of civilized states and future expansion becomes impossible, it will, of necessity, have to seek satisfaction in static rather than in dynamic ideals.

In contemporary thought the idea is often expressed, or at least suggested, that our civilization is to be the ruling force in the future in this sense, that all other civilizations are to be subservient to it, and that the Western races are to form a privileged caste. A conception such as this is untrue to the fundamental characteristics of our civilization. A return to the caste system, even with our race as the ruling order, would be a denial of the essential principle of social mobility. The wealth that would be drawn from the subject territories under a system of this kind would inevitably lead to national degeneracy. The social and political attitude thus introduced would have a most pernicious reflex influence upon the internal institutions of the Western nations. As they are not so constituted as to form in themselves a compact caste, the result would be that an inflexible social stratification would be developed within them, and the laboring classes reduced again to a

position of virtual serfdom. It is due, therefore, to the very ideals which constitute our superiority and secure our welfare that we should allow to the territories which come under the control of the Western nations the same freedom of economic development which has rendered the latter powerful and prosperous.

The movement which we are considering carries with it the danger of a revival of actual slavery. As the former stages of evolution which our civilization has passed through began with the existence of a large slave population,—in the ancient cities and in the societies of medieval Europe,—so there is now, with the entry upon that phase in which the whole world will constitute a unified economic organism, an unavowed but powerful tendency to reduce a large part of mankind to a position of servitude. The belief in the perfectibility and ultimate unity of the human race is on the wane, and present inferiority is treated as necessarily permanent. With the economic development of the new regions that are now coming under European control there is created a great demand for unskilled labor, far greater than the slight inclination of the black races to work prompts them to fill. It is not surprising, therefore, that the introduction of a system of compulsory labor is advocated. The dignity of labor is to be taught the natives by force, and methods which we have been accustomed to consider among the worst abuses of slavery are freely advocated as the only means of endowing the backward races with the progressive spirit of industry. Should this tendency continue to gain strength, it is clear that the world will have to fight the anti-slavery struggle over again from the beginning, but on a far wider area and involving far more powerful interests than the recent national anti-slavery crusade which we had thus far considered as the final word in this matter.

We have thus far looked at the movement of expansion from the point of view of the interests of our own civilization. We now approach the far more difficult question as to what is to be our attitude towards the civilizations and social systems with which we have to deal in colonial administration. At first sight it would seem an eminently proper policy to favor the introduction of our own institutions among all the populations that come under our control. Every nation considers its own institutions as the highest products of social evolution, and no better destiny could be conceived for other races than that they should be allowed to share in the benefits which rational laws would bestow upon them. Moreover, it is exceedingly difficult to understand alien social systems and to judge correctly the trend of their evolution. It would indeed require the wisdom of a platonic philosopher to forecast properly the spontaneous development of such societies. With our own institutions we are familiar. Their virtues we believe in. They seem simple and rational; we can easily put them in the form of legal enactments and thus bestow them upon our dependents as a complete and satisfying whole. Moreover, the general desire to set the impress of our national genius upon the world finds no better expression than this propaganda of institutions. In fact, to many people the entire justification of the expansion movement lies in the promise of the spread of better institutions of the European or American type. When we, therefore, ask ourselves the question, Which is the better policy,—not to interfere with native customs and civilization, in fact to foster their natural development, or to sweep away the customs of backward races which so often seem but the bonds which hold them in slavery and to put in their stead the liberal institutions of our own society?—the answer is most readily given in favor of the latter alternative.

And yet the policy of assimilation has thus far in practice proved unsuccessful and at times even disastrous. Experience seems to show that even those institutions which are by us considered the very foundation of good government may have harmful results when introduced into another society. The most striking example of this is found in the experience of Great Britain in India. The English are not an assimilating race. They have always had clearly in mind the economic purposes of expansion, and have allowed the political missionary spirit comparatively little sway. They have not been filled with the desire of transforming native societies. Still, they have introduced certain institutional reforms, which to them seemed absolutely essential and not attended with any risk. Thus, who would not agree that the impartial enforcement of contracts, the system of judicial appeals, representative government, the institution of the jury system, a free press, and liberal education are things about the usefulness of which among us there can be no two opinions? The British introduced these institutions into India, with the best of intentions, and yet with such results that their opponents can now plausibly argue that they must have been animated with the sinister purpose of disrupting and undermining Indian society. The most unforeseen consequences have resulted. Through the rigid enforcement of contract the vast agricultural debtor class has been gradually enslaved to the money-lenders and is being ousted from its ancestral holdings. As the government upholds the principle of freedom of contract and will not fix the price of grain in times of shortage, the calculating native capitalist is enabled to hold his stock of food for higher prices regardless of the fact that people may be dying of famine by the thousand in the neighborhood. The scientific system of appeals favors the machinations of unscrupulous native pleaders,

who gain a livelihood by stirring up litigation and making the most of judicial delays, with the result that the confidence of the Indian population in the justice and efficiency of the law has been impaired. The granting of representative government in municipalities has led to the sharp accentuation of religious and racial animosities, and has especially increased the bitter feeling between Mohammedans and Hindus, the former of whom oppose strongly any system of representation based upon numbers. The same result has been brought about by the creation of a free press, which uses its freedom not only for the purpose of constant agitation against the British, but also to stir up and perpetuate the feeling of mutual hatred between the various great religions of India. The jury system has undermined the confidence of the natives in the justice of the British, because no white jury can be found to condemn a white man for the murder of a native. And finally, the system of higher literary education, conceived by Lord Macaulay for the purpose of initiating the Oriental mind into the philosophy and literature of the West, has resulted in the destruction of native *morale* among the educated classes and in the creation of a literary proletariat, hungry for public employment. The complete bearing of these social changes deserves more careful study than we can here give it, but the above brief indication may suffice to point out how incalculable are the results of the importation of foreign institutions into a native society.

France is the classical land of assimilation. The colonies that were left to France after the Napoleonic era were few and small. A certain romantic and sentimental interest attached to Martinique and Guadeloupe, and they became the spoiled children among colonies. Most of the institutions of the mother country were extended to them. When in the middle of the last century the colonial empire

of France again expanded, through the acquisition of territory in Africa and Asia, the older principles of action were not abandoned. The new territories were treated as regions within which French civilization was to be forthwith established. The most radical belief in constructive meliorism still governed French political thought. The results of this policy are now before our eyes. Algeria has long been treated as a part of France. The attempt has been made to give the natives a personal status, to destroy the family and the tribe, to break up the communal landholdings, to apply to the forests the stringent regulations of the French forest laws, with the result that to-day the natives look upon the French as their arch enemies, bent upon destroying their social life and utterly ruining them. It is in the matter of individualism that the assimilating policy is apt to make its most radical attempts at reform. The grouping of populations in families and tribes is looked upon as a mark of barbarism, and it is regarded as the first principle of a liberating policy to recognize the right of the individual fully to control his property. While this is apparently a liberalizing movement, its results are usually far from those aimed at. Not prepared by gradual social evolution for the individual status, the native when artificially placed in this position is helpless and becomes a victim of shrewder persons ready to take advantage of his weakness. Thus the natives of India, the fellaheen of Egypt, and the Kabyles of Algeria, when legally individualized, soon lose all effective economic liberty.

In Indo-China the French began by remodeling and destroying the native institutions and even attempting to introduce the entire legislation of Continental France. But they discovered in time that such a policy, of doubtful wisdom in Algeria, is totally unsuitable for a tropical colony like Indo-China, and at present they show a tendency to

maintain such native institutions as the Annamite commune and even allow the mandarinate a certain influence. Wherever the French elective and representative institutions have been introduced into tropical colonies they have led to the most grotesque results. In the Indian possessions as well as in Senegal, the elections have become a pure formality. Thus, while thousands of votes are officially returned, hardly a native is seen to enter the polling-place on election day, the entire reports being prepared in advance by public officials. During the last decade a powerful opposition has arisen in France to the continuance of the policy of assimilation. This movement has received much support from the success of the French administration in Tunis, where the native institutions, beliefs, and customs have not been unduly interfered with. In West Africa and in Madagascar there has also been a certain willingness to acknowledge the justification of divergent social institutions. But the essential character of French colonial policy is still assimilative in the main, although a greater willingness is shown to make concessions to the natural obstacles opposed to such a policy.

The policy of assimilation rests upon the old rationalist doctrine of the universality of human reason. An institution once declared rational must as such be applicable at all times and in all places; and though individuals may at first in the darkness of superstition resist the introduction of such institutions, they will, if forced to accept them, be ultimately liberated thereby and raised to a higher plane of existence and civilization. The essential element in this belief is that reason is the one controlling force in human conduct, and that rational institutions are productive of rational action, and hence are the sole requirement for well-ordered and civilized life. As a matter of fact, however, the science of the nineteenth century has abandoned this

belief in the universal supremacy of the conscious rational faculty. Men are governed far more by their inherited beliefs, customs, and instincts, than by a conscious choice between different courses of action. This is true among ourselves, and it is so to an exceedingly greater extent among more aboriginal peoples. The doctrine of assimilation makes a demand upon the rational element in human nature which not even the action of the most highly developed individuals, not to say nations, could justify. The natives are to abandon the entire complex of customs and beliefs which have thus far guided them through life, and by an act of selective reason, to adopt institutions foreign to their social experience. Modern science is agreed that inherited psychological elements—the constitution of the mind—are the most persistent phenomena of which we have any knowledge. New ideas may be poured into the consciousness, may even be understood by the rational faculties, but they will leave no trace upon the mental constitution and upon the real spring of action. The most conclusive proof of this is found in the psychology of those races which have come, through the chance of history, under the control of different conquerors. Through numberless generations under the most varied historical conditions and environments, the descendants of the same race will continue to develop similar psychological traits. Thus, parts of the Malay race have been for centuries under the rule of three different European peoples, and nevertheless the Filipinos, with their Spanish instruction, the Javans trained under the Dutch colonial system, and the Malays of the mainland who have been under English tutelage, all display identical characteristics and have the same intellectual constitution which the earliest explorers noted in their day. In the same way we may trace among the negroes of the United States, of Hayti, and of Martinique,

the same psychological tendencies which are found among their distant relatives in the African forests. The actual experience of colonizing nations and the results of scientific investigation leave room for but one opinion upon the policy of assimilation, that it rests upon a purely ideological basis and runs counter to the scientific laws of psychic development.

The very first requirement in laying the foundations of a colonial policy is, therefore, the careful study of the ethnical character of the races with whom we come in contact. The ethnological survey is the most important part of colonial administration. We must learn to respect the psychological and social character of the people with whom we have to deal,—respect it sufficiently at least to become acquainted with it, to study it carefully, and to analyze its elements.[1] When we consider the difference between the highly trained, industrious, peaceable, frugal Chinese and the shiftless, indolent Malays; between the dreamy, philosophical Burmans and the warlike, laborious tribes of Central India; between the fellaheen of Egypt, the Moors of Algeria, and the multitude of negro races in Central and Southern Africa; the very idea that one set of institutions, one form of social practice, could be applicable to all these multiform societies, would seem the result of pure ignorance. What the colonial administrator needs above all else is imagination. Not the abstract imagination which would create an artificial system, but the reconstructive imagination which is able to understand the social conditions of an alien population. In colonial affairs we are in need more of the sense of justice than of benevolence.[2] Nothing is more dangerous than an active benevolence

[1] The most successful investigation into the psychology of native populations has been carried on by the ethnological department of the Dutch colonial government under the councilor on native affairs, Mr. Snouck-Hurgronje.

[2] It is an Arab proverb that one day of justice is better than seventy years of prayer.

without a proper knowledge of the civilizations with which it interferes. But the sense of justice which accords them a certain right to live, which agrees that there may be a justification for divergence from our standards, is absolutely essential for lasting results in colonial administration. Native societies themselves desire justice rather than benevolent interference, and appreciate far more a ruler who respects their customs while governing them with a strong hand, than one who, under the claim of humanity and benevolence, meddles with their every social arrangement and institution.

But, we may well ask, if we are not to use our civilization as a criterion for our colonial activities, how shall we be guided in the construction of a colonial policy? Are we to follow simply the most material needs of our commerce and industry, and, totally disregarding the higher civilization of the natives, allow them to shift for themselves; or is there some way in which we can understand the needs of their own civilizations and assist them in realizing their destiny? The simplest answer, and one that appeals to many minds, is that we should let all these alien societies alone, and allow them to develop unhindered, because no nation has the right to regard itself as a providence for the social regeneration of other races. But when we consider that we have actually become responsible for the destiny of great multitudes of people, and that this responsibility cannot practically be avoided, we shall not be satisfied with any such negative statement of our duties and relations. We need a more positive guide, one also that will harmonize our attitude toward the various elements in civilization. May we not, after all, find in our own civilization the guidance which we seek? We have found that, statically considered, as a definite system of customs and institutions, we cannot apply it directly in

solving the problems of colonial development. It is clear that we cannot confer by acts of legislation the results of our social and political evolution upon an alien people. The fruits of civilization cannot thus be transferred. But will not a study of the dynamic elements that have assured our social progress give us some clue as to a proper colonial policy? While we may well despair of bestowing upon an alien race the entire complex of our civilized institutions and customs and beliefs, may it not be possible to modify their social evolution in accordance with our experience and thus to obtain for them gradually a higher degree of social well-being and efficiency? The evolutionary and structural ideals of our civilization may be of greater value in this matter than its positive standards and its resultants in our social life.

Defined from the structural point of view, civilization implies a social organization of highly centralized energy combined with great mobility of the individual parts. This mobility involves the absence of a deadening fixation of activities by custom or caste, leaving the individual free to seek the line of endeavor in which his own energies may find their best and most fruitful expression. It involves a constant betterment of the condition of humanity through invention, and consequently an intensive cultivation of the natural resources of the civilized state. The surplus thus obtained enables the civilized society to devote a large part of its energies to the advancement of education, art, and science. The distinction between civilization and barbarism lies, therefore, primarily in the mobility of social forces and in the readiness with which they are able to concentrate their efforts at any given point. The impact thus produced, no barbarian society can withstand. The positive superiority of a given society is thus not due to the presence of a large armed force, but to the maintenance of

conditions which will enable it to bring to bear at any time and at any given point the entire national energy.

It is imperative that we should clearly see that in colonial politics we have to deal with societies in their broadest aspects,—with civilization and not with individuals. The greatest mischief is wrought by looking upon the natives as so many individuals, clay to the hands of the potter, to be fashioned with ease into some resemblance to European or American. It is only as we modify the structure, principles, and customs of native societies, that we can exert any lasting influence upon individuals. Just as the quality of our Western civilization depends closely upon social structure, so—though in a much larger degree as social cohesion is much stronger in the lower strata of mankind—the civilization of a Hindu, or a Malay, or a Hausa, depends not upon what we can teach him individually, but how we can affect the structural character of the society to which he belongs. To modify the direction of social evolution by slow and natural methods, that is the most ambitious program we can in reason set for ourselves; to take a Tagolog and make of him an American is the naïve impulse of inexperience. For though isolated individuals may adopt the best thought of a higher civilization,—we need but think of the negro valedictorians in our universities and of men like the Maharajah Dhuleep Singh,—they cannot hold out against the social influences of their own race nor can they impart to it their acquired civilization. Societies must be viewed as a whole, united by the strong bonds of tradition and of lasting and intimate relations among the members. There is a life purpose, unconscious though it be, even in the lowest forms of civilization. This we cannot simply suppress by rough-shod measures, and substitute for it point blank and indiscriminately the purposes and methods of our own civilization. Indeed, we

can do no more than, by gradually substituting new economic forces and new social motives, to foster a development in the general direction of our own civilization.

Bearing in mind constantly the path which our own social evolution has traveled, and analyzing the conditions of its development and progress, we shall give attention, first of all, to the creation of a sound economic basis for social life in the colonies. The development of a productive, in place of a purely consumptive, economy, and an assurance of the increasing mobility of all factors in economic life, are the first desiderata. All the higher elements of civilization can be obtained only as the fruit of a wise and perfectly adjusted economic system. The art of Florence arose after medieval humanity had served a long and laborious apprenticeship in industrial life, and the dramas of Shakespeare could not have been written had the nation been living merely from hand to mouth. The most elementary purpose of a civilized colonial policy would therefore seem to be the prevention of the reckless and detructive use of the natural wealth in forests and mines for mere private profit, and the encouragement of settled agricultural and industrial pursuits. The greatest among the American negroes clearly perceives and founds his life-work upon the fact that a race cannot be given a self-sufficing position in civilized life unless it has a sound economic organization, and unless it has trained itself to a productive industry.

Among the essential duties of a civilized state there is none more important than the guaranty to every individual under its rule of the conditions which make healthy life possible. As long as a state has not solved this elementary problem, as long as periodical famines sweep away large numbers of peasants, or accumulations of filth make residence in the towns a constant danger to health and life,

the state or society which permits such conditions cannot be called fully civilized. No efforts should, therefore, be spared in the prevention of plague and famine, the two dark thunder-clouds which overhang backward communities and which relentlessly threaten suffering and destruction. No society, no group of individuals, can attain to a state of self-realization and of true inward freedom, as long as it is under the spell of such sinister powers.

It is, however, not only our duty to free these populations from terrors and dangers inherent in their civilization and surroundings, but to protect them against the even more serious risks which are involved in the meeting of civilizations on different planes of development. These dangers are twofold,—arising from the use of deleterious substances and modes of life, or from the creation of an apparent individual freedom of contract, which, however, usually results in the entire destruction of economic independence. The surest means of protection against these risks lie in a scrupulous maintenance of the native *morale* and social organization; any attempt to deal with natives merely as individuals in the Western sense will, without fail, endanger their independence, their health, and their life. It has been abundantly experienced that when the ordinary members of a backward race are dissociated from the organism to which they belong and are brought into direct contact with a higher society, they will usually lose their native *morale* and add only the dangerous and even vicious sides of the advanced civilization. The only way to protect the individual is to protect the society to which he belongs, and if any improvement of his condition be attempted, it should not involve the weakening of social relations.

To foster the cohesion and self-realization of native societies, while at the same time providing the economic basis for a higher form of organization,—that should be the substruc-

ture of an enlightened colonial policy. We can conceive of no greater crime than the wanton destruction of such societies, for it involves the moral and physical degeneration of their members. This is true of even the lower forms; there is no excuse for destroying the tribal organization; it should be allowed to develop into the higher phases of social life. But when we have to deal with such nations as the Annamites, Burmans, and Chinese, the insensate folly and criminal cruelty of treating their civilization as mere rubbish to be cleared away would seem too apparent to need further emphasis. Such nations should rather be encouraged to take pride in their own historic character, to develop their marvelous inborn artistic talents, and thus to impart to the general civilization of the world new and rare treasures, than to be treated as unworthy savages fit only for work as beasts of burden and for an apish imitation of European forms.

When we consider the specific basis of a colonial policy with respect to the native races, we shall see that it rests upon a foundation composed of a few simple economic principles. In such an investigation it becomes clear that while Western societies in their contact with the natives of Africa and Asia will be able to accomplish certain useful results, they are, on the other hand, attempting many things which it will be impossible to attain under the present methods. The one indisputable blessing which Western nations are bestowing on primitive races is that of peace. This is the greatest achievement of the European régime in India and in Africa. The terrible inter-tribal warfare and the bloody raids organized by Arab slave-drivers in Africa have largely been put an end to and have given place to more peaceful ambitions. In connection with this, a civilizing colonial policy will also improve the general conditions of life. The introduction of a scientific medical service and of advanced principles of sanitation is a primary duty of colonial ad-

ministration. The most fundamental conditions of life being thus assured, it is necessary that mobility of the elements in economic action and free mutual intercourse be made possible by the opening-up of routes connecting the various regions and making them accessible to the populations of one another. The construction of roads and railways is therefore one of the most potent agencies of civilization. In that way alone is the penetration of the methods and products of civilization to the interior regions made possible. In order to provide for improvements such as these as well as to ondertake lines of industrial development which surpass the capacity of the natives, it is necessary that capital should be invited to participate in the development of new regions and that such investments should be rendered as safe as possible. The native population should be trained in industrial pursuits as well as in the arts of agriculture so as to utilize the natural resources without exhausting or destroying them. The substitution of intensive methods for the exhaustive barbarian exploitation which is now the rule throughout Africa as well as in other undeveloped regions of the world is the essential purpose of the civilizing policy.

But when we come to the higher elements in civilization, —intellectual culture and religion,—the road is not so plain nor is it at all certain that an attempt directly to influence the more primitive races will at first be successful. In this connection we must again remember that we are dealing not with individuals, but with societies, and that it is impossible to change the complexion, the character, and the *morale* of a society by giving a certain intellectual education to a few among its members. We have already dwelt upon the fact that civilization can affect the condition of backward societies only by setting in operation economic forces which will gradually modify the social structure. But the attempt to

eradicate the intellectual character of these peoples and to substitute for it the complex intellectual and moral culture of Western civilization through the process of instruction, cannot in the nature of things be accompanied with any large measure of success. Psychological characteristics are among the most stable and fixed phenomena of which we have any knowledge. They are undoubtedly subject to modification, but only very gradually in the course of centuries and as a result of radical structural modifications.

The British policy of educating the Hindus according to European methods has failed and has produced lamentable results, because it entirely overlooked the truth that we cannot modify societies by giving them the accessories, even the highest, of another civilization, but only by influencing structural development. As in this case of India, so in general, this can be effected only by changing the economic basis on which the social structure rests. The form of education which will yield the greatest results is technical training, accompanying the actual development of economic life and the growing consciousness of control over natural forces. The political organization that will be most potent in influencing social growth is the city; and through the creation of a true communal life in towns and cities lies the road to the ultimate self-realization of native societies, just as national life in the West is only an expansion and development of the ideals and institutions of the classic and medieval city-state.

A more rapid and direct influence could be looked for should race mixture between Europeans in India and in the tropics become general. Were the conditions in the tropics such that the Europeans could freely intermarry with the native populations the problems we are considering would assume an entirely different aspect, for, as in the white population of the United States, there would come into being

a new race. Through the amalgamation of racial characteristics there would arise new beliefs, customs, and ideals, in fact a new philosophy of life and a new intellectual constitution. Though in the past there has been some mixture of European and native blood, and especially the Latin races have shown themselves willing to enter more freely into alliance with dependent races, it still remains true that the results of such racial union have not been of the most encouraging nature. The mixed breeds have at times, as in the case of the mulattoes, shown great excellence of physique and considerable power of mind; in most cases, however, they have appeared rather as degenerate types. They have occupied an unfortunate social position, being looked down upon and suspected by both of the races from whom they have descended, and becoming the easy prey to vice and to general decadence. At the present time the tendency toward race mixture is less strong than ever before. Races are becoming mutually exclusive, and especially those which consider themselves higher show a strong desire of keeping their blood pure. It is therefore not to be expected that the psycholoigcal differences which separate white and colored mankind will be modified by racial mixture.

The side from which the intellectual nature of the non-European races will, perhaps, prove most accessible is that which is connected with the mastery of nature. The people of both Asia and Africa have lived under the overpowering influence of resistless phenomena of nature. The primeval forest world of Africa, the typhoons and floods of the East Indian islands, the famine and pestilence of India, her vast mountains, and the ferocious rivers of China, which bring destruction to millions every few decades,—these are the phenomena the like of which the Western world does not know. With us nature is more docile and of greater amenity. It is consequently not a matter of surprise that the

forces of nature should have been understood and mastered first by the Western mind. It is through this mastery that the Western peoples can impress other nations most successfully with a sense of their superiority. By relieving the tyranny which nature now exercises in the primitive forests of Africa and in plague-stricken India, Western civilization may become the Prometheus of the nations that are yet in bondage. The mastery of the resources and forces of nature has given us a new conception of life, it has relieved us from the fear of the capricious powers by which primitive man sees himself threatened on all sides. When we look back at the medieval man, whose belief in miracles, amulets, and incantations do not put him at a very great distance from modern barbarians, we feel that our command over natural forces makes a return to the medieval point of view hardly conceivable. As we prepare the more backward races to share in this mastery over nature, they will also have a better understanding of our intellectual life and of our beliefs. The haughtiest Brahman even stops to wonder as he sees the processes of electrical industry and notes the sure grasp with which the forces of nature are made subject to the human will.

"From the ground up" should be the motto of an intelligent colonial policy. Not to attempt to bestow upon the backward races the blessings of a civilization which they cannot understand and which may be a deadly poison in the form in which they are offered, but to work in alliance with the universal forces of social evolution, to battle against the exploitative tendencies which would carry us back into another age of barbarism more cruel and more difficult to overcome than any former one, and to give to the more primitive societies a secure economic foundation for future progress and development,—these should constitute the elements of a sound colonial policy. If we restrict our efforts

to those things which we clearly see can be accomplished,—to the maintenance of peace, the protection of health, the creation of adequate means of communication, and assistance in industrial development; if we set our face firmly against slavery and exhaustive exploitation in all its forms, we may rely upon the working-out of the colonial problem with the same confidence that we place in the mechanism of a complicated electrical motor. But in order to obtain such results patience is most needful. Civilization cannot be transferred as a whole. To deal with intellectual and spiritual matters directly involves such difficult psychological considerations, such incalculable contingencies, that in an effort to develop a constructive colonial policy, it seems wiser to make sure first of the things in which at least a somewhat clearer forecast of results and a somewhat safer calculation of effects can be had, than is the case with impulses and enthusiasms the range of which passes at present the scope of careful analysis. Activities along these lines are by no means to be discouraged, but they fall into a different sphere from that which the legislator and administrator can hope to deal with successfully. One principle seems clear enough, namely, that our moral civilization cannot be propagated by laws, perhaps not even by exhortation, but that the only true civilizing influence is *example freely followed*. Thus the primitive Germans voluntarily chose their Roman neighbors as models for their action, and Japan to-day is of her free will imitating our institutions and methods because she recognizes in them a certain superiority. By setting up models of action and conduct which will be gladly and spontaneously imitated by other races, the Western nations may, indeed, hope to exert a powerful civilizing influence.

It will, therefore, be wise for the colonial legislator not to attempt too much, not to have too ambitious a programme. But if rightly planned, the economic reforms which it is in

his power to effect with success, may, like the massive architecture of a cathedral crypt, in time upbear an edifice which will answer larger purposes than those of mere economic welfare and progress.